Operations/Service Manual

smith&nephew

Smith & Nephew 450P and 460P 3-CCD Camera Control Units

CE

Glossary of Symbols

CAUTION: U.S. Federal law restricts this device to sale by or on the order of a physician.

Power On

Power Off

Up Button

Down Button

MICROPHONE

PROCEDURE

WHITE SET

MENU

ENHANCEMENT

SELECT Button

BRIGHTNESS

DO NOT PLUG IN WET

Color Camera

Input

HEAD SELECT Button

Line Input

IEEE-1394 DV/SDI/DVI Output

RGB Analog Output

Video Output

Bidirectional Port

Y/C Analog Output

Serial Number

Equipotentiality

Date of Manufacture

UL Classification

Fuse

Caution: See Instructions for Use

Electrical Shock Hazard

Type CF Equipment

European Representative

EU: Not for general waste

Table of Contents

Glossary of Symbols 3
Preface 5
Introduction 5
HERMES-Ready™ Camera Control Unit Information 5
Indications for Use 6
Contraindications 6
Warnings 6
Precautions 6–7
System Components
Unpacking and General Inspection 7
Front Panel Controls 8–10
Rear Panel Controls 11–12
Camera Head Controls 13–14
Preoperative Setup
Prepare the Camera Head 15
Inspect the System Components 15
Light Source 15
Electrical Connections 15
Cable Connectors 16
Connect the Camera Head 17
Connect the Video Accessories 17
Recommended System Configuration
IEC 60601-1-1 Compliant System Configuration 18
Equipment Setups
Customizing Equipment Setups 19
Setup Configurations Summary 19
Equipment Setup 1 20–21
Equipment Setup 2 22–23
Equipment Setup 3 24–25
Equipment Setup 4 26–27
Equipment Setup 5 28–29
Operation
Turn the Camera On 30
Adjust the Monitor to the Color Bars . . .30
Tips for Adjusting Color Monitors 30
Confirm Attachment of Coupler/ Videoendoscope to Camera Head 30
White Set the Camera 31
Camera Control Menus 32
SELECT Button 32
UP and DOWN Buttons 32
Menus and Sub-Menus 33–34
Zoom (460P CCU Only) 35
Power-Up Initialization 35
White Set Menu 35–36
Enhancement 36–37
Brightness 37
Procedure 38
Button Setup 38–39
Language 39
Program 39–41
Custom1 and 2 41–43
Cleaning and Sterilization
Cleaning the Camera Control Unit 44
Cleaning and Sterilizing the Camera Heads 44
Cleaning the Fan Grill 44
Service and Maintenance
Service 45
Service Philosophy 45
Changing Fuses 45
Maintenance 45
Recommended Annual Performance Checks 45
Electrical Interference 45
Environmental Protection 45
Troubleshooting 46–47
Specifications 48
Ordering Information 49–50
Glossary 51–54
Guidance and Manufacturer's Declaration – Electromagnetic Immunity 55–56
Guidance and Manufacturer's Declaration – Electromagnetic Emissions 57
Guidance for Separation Distances . .58
Warranty
Warranty . . . . . .Back Cover
Service Replacement Program .Back Cover

Figures

1a. Smith & Nephew 450P CCU Front Panel 8
1b. Smith & Nephew 460P CCU Front Panel 8
2a. Smith & Nephew 450P CCU Rear Panel 11
2b. Smith & Nephew 460P CCU Rear Panel 11
3a. Smith & Nephew 460H Three-Button Camera Head 13
3b. Smith & Nephew ED-3 Two-Button Camera Head 13
4. Smith & Nephew 470H Three-Button Camera Head 14
5. Video Cable Connectors 16
6. Camera Head Connection 17
7. IEC 60601-1-1 System Configuration .18
8. White Setting the Camera 31

Tables

1. Guidance and Manufacturer's Declaration - Electromagnetic Immunity 55–56
2. Guidance and Manufacturer's Declaration - Electromagnetic Emissions 57
3. Guidance for Separation Distances .58

Preface

This manual provides the information you need to operate and maintain the Smith & Nephew 450P and 460P 3-CCD Camera Control Units. Prior to using this equipment, please read this manual thoroughly, paying particular attention to the operating instructions, warnings, and cautions. Smith & Nephew surgical equipment is designed for use only by medical professionals who are completely familiar with the appropriate surgical techniques and video procedures.

Introduction

Smith & Nephew 450P and 460P 3-CCD CCUs (Camera Control Units) are state-of-the-art video CCUs designed for use in endoscopic surgical applications. Fingertip control of camera features (enhancement features and zoom capabilities [460P camera only]) and accessories (VCRs, video printers, and still image recorders) maximize surgeon control over the visualization system and documentation.

The 450P and 460P CCUs' advanced 3-CCD digital circuitry provides superior color rendition and high-resolution images. Their advanced automatic features offer enhanced ability to customize Smith & Nephew cameras to meet individual procedural requirements. The 450P and 460P CCUs offer optimum light sensitivity to ensure sufficient light output at all times in various endoscopic surgical applications. Their improved camera shutters allow for smoother light compensation. Variable controls such as automatic shutter settings and light adjustments permit adaptation of the CCU to address changing conditions during surgery. The enhancement control gives you the ability to enhance the contrast and edges of anatomical features. The digital zoom feature provides visual access to surgical sites previously difficult to visualize.

The 460P CCU incorporates four digital output ports: IEEE-1394 DV (digital video), SDI (serial digital interface), and two DVI (digital visual interface) ports. The IEEE-1394 port allows direct connection with any accessory compatible with DV format. The SDI port allows high-quality video to be distributed up to 300 feet using a single coaxial cable. The DVI ports allow high-resolution video to be directly displayed on a 1280 x 1024 pixel digital flat panel display.

Smith & Nephew 450P and 460P HERMES-Ready™ Camera Control Units Information

The Smith & Nephew 450P and 460P HERMES-Ready Control Units are configured to be connected to the Smith & Nephew HERMES® Digital O.R. Control Center via the bidirectional (HERMES-Ready) port, which uses RS-232 serial communications protocol. When connected, the system functions may be accessed by direct voice commands or by manual use of a touch screen control (HERMES Pendant®).

It is recommended that the physician and support personnel are thoroughly familiar with the setup and operation of the Smith & Nephew HERMES Digital O.R. Control Center. Please refer to the Smith & Nephew HERMES Digital O.R. Control Center Operating and Maintenance Manual for the proper setup, use, and troubleshooting of the Voice Control Interface portion of that device.

When the Smith & Nephew HERMES Digital O.R. Control Center is connected and active, the function parameters of the Smith & Nephew 450P and 460P HERMES-Ready Control Units may alternatively be adjusted using the buttons on the front panel.

For troubleshooting or further information, please refer to your Smith & Nephew HERMES Digital O.R. Control Center Operating and Maintenance Manual.

Indications for Use

The Smith & Nephew 450P and 460P 3-CCD Camera Control Units are indicated for use in endoscopic surgical procedures to allow visualization of the articular cavities, body cavities, hollow organs and canals when used with an appropriately indicated endoscope.

Additionally, when used in conjunction with a Smith & Nephew light source and light cable the 3-CCD Camera Control Units are indicated for use in endoscopic surgical procedures in the thoracic cavity when used with an appropriately indicated thoracoscope.

Contraindications

None known.

⚠ Warnings

- **It is the surgeon's responsibility to be familiar with the appropriate surgical techniques prior to use of this device.**
- **Read these instructions completely prior to use.**
- **DANGER: There is a risk of explosion if used in the presence of flammable anesthetics.**
- **To prevent electric shock, do not remove any covers or screws from the Camera Control Unit (CCU) or camera head. There are no user-serviceable components inside. Dismantling the equipment will void the warranty.**
- **If this unit is configured as part of a system, the entire system should be tested for compliance with IEC 60601-1-1.**
- **If the leakage current of the configured system exceeds the limits of IEC 60601-1-1, install an appropriately rated UL 2601-1/ IEC 60601-1 approved isolation transformer and retest the system.**
- **The use of accessory equipment not complying with the equivalent safety requirements of this equipment may lead to a reduced level of safety of the resulting system. Consideration relating to the choice shall include:**
  - **Use of the accessory in the patient vicinity.**
  - **Evidence that the safety certification of the accessory has been performed in accordance with UL 2601-1/IEC 60601-1 and/or IEC 60601-1-1.**

Precautions

℞ ONLY U.S. Federal law restricts this device to sale by or on the order of a physician.

- Do not allow fluids to enter the device. Damage can result.
- Electrical safety testing should be performed by a biomedical engineer or other qualified person.
- All products used in conjunction with this camera control unit, such as video monitors, video printers, etc., are likely to have an inherent leakage current at their video connections. Thus, their connection to this camera control unit would likely increase the leakage current at the camera control unit's chassis.
- When looping the video output to more than one piece of equipment, the termination switch on the last looping piece of equipment should be in the 75 Ω (ohm) or the "ON" position if the equipment provides that option.
- Do not plug the camera cable connector into the camera control unit if wet. Moisture on the connector pins of the camera cable will damage the circuitry and void the warranty. Ensure that the connector pins are completely dry before plugging the camera head into the CCU.

- This equipment is designed and tested to minimize interference with other electrical equipment. However, if interference occurs with other equipment it may be corrected by one or more of the following measures:
  - Reorient or relocate this equipment, the other equipment, or both.
  - Increase the separation between the pieces of equipment.
  - Connect the pieces of equipment into different outlets or circuits.
  - Consult a biomedical engineer.
- This equipment contains electronic printed circuit assemblies. At the end of the useful life of the equipment it should be disposed of in accordance with any applicable national or institutional related policy relating to obsolete electronic equipment.

Unpacking and General Inspection

Prior to using the Smith & Nephew 450P or 460P 3-CCD Camera Control Unit, it is essential that all system components be inspected for damage which can negatively impact the system's performance. Inspection should include all equipment to be used in surgery including endoscopes, cables, and accessories.

1. Remove the CCU and accessories from the shipping container. Be certain to open and inspect all boxes and sealed plastic bags to ensure that all components are accounted for.

   If any parts are missing or damaged, contact your authorized Smith & Nephew representative.

   Save the carton and packing materials in the event a component needs to be returned for repair.

2. Inspect all video components for damage during shipment. Contact your authorized Smith & Nephew representative if damage is noticed. Damage to endoscopes can impact performance. For more information, consult the Instructions for Use provided with the endoscope.

3. Inspect the sheath on the light source fiber optic cable for damage. Cuts, abrasions or tears in the silicone sheath will cause a loss of light.

Component Controls and Functions

Front Panel Controls

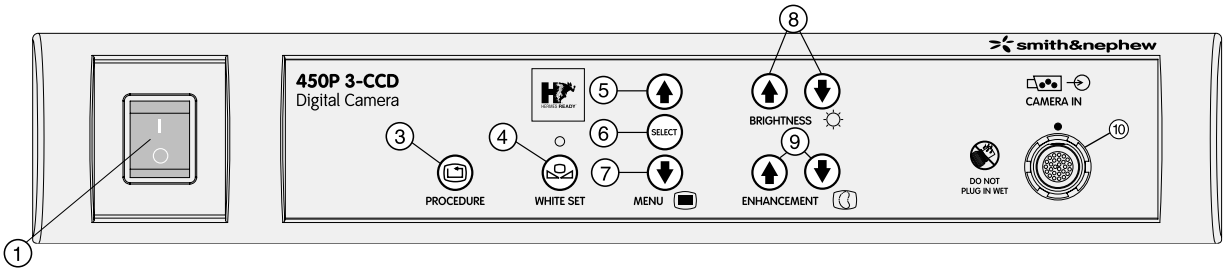


Figure 1a. Smith & Nephew 450P 3-CCD HERMES-Ready™ Camera Control Unit Front Panel

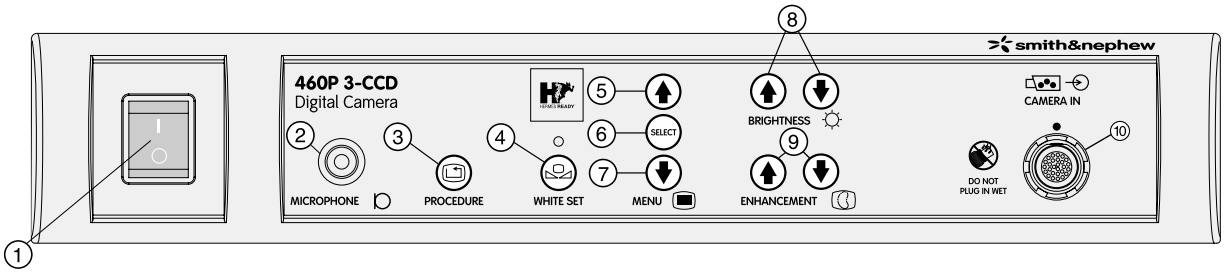


Figure 1b. Smith & Nephew 460P 3-CCD HERMES-Ready™ Camera Control Unit Front Panel

Front Panel Controls (continued)

Control	Function
1. Power Switch	Turns the control unit on and off. The power switch is illuminated green when the control unit is on.
2. MICROPHONE Input (460P only)	The 460P CCU (Camera Control Unit) includes a microphone input which accepts standard 1/4" connector microphones. It allows audio to be added to the DV output so users can add commentary to video clips produced from the camera control unit DV output. The rear panel audio line input and front panel microphone input may be used simultaneously.
3. PROCEDURE Button	The PROCEDURE Button is used to sequence through the procedure setting options, i.e., Arthroscopy, Laparoscopy, Custom, etc. Each option has predetermined image parameter settings that are designed to be optimized for a given procedure type. When the button is pressed, the name of the current procedure appears at the bottom of the surgical display screen and the image appearing on the screen utilizes the parameter settings for that particular procedure. A procedure is selected by pressing the button until the desired procedure setting is displayed. The default procedure setting can be set using the OSD (On-Screen Display) Menu.
4. WHITE SET Button	The WHITE SET Button automatically adjusts the camera for optimal white balance when the button is depressed and the camera is focused on a white object.
5. MENU Button (UP)	The UP or DOWN buttons cause the cursor to scroll through the available menu selections after the OSD Menu has been called up via the SELECT button. When the end of a menu is reached, the next UP or DOWN button activation will bring the user either to the top of the menu or the bottom of the menu.

Front Panel Controls (continued)

Control	Function
6. MENU Button (SELECT)	The SELECT button calls up the top-level OSD Menu.
7. MENU Button (DOWN)	The UP or DOWN buttons will cause the cursor to scroll through the available menu selections after the OSD Menu has been called up via the SELECT button. When the end of a menu is reached, the next UP or DOWN button activation will bring the user either to the top of the menu or the bottom of the menu.
8. BRIGHTNESS Buttons	The BRIGHTNESS buttons increase or decrease the brightness of the image when the ELC (Electronic Shutter Control) is in AUTO mode.
9. ENHANCEMENT Buttons	The ENHANCEMENT function enhances the appearance of detail in the image. The desired enhancement level is set using the ENHANCEMENT UP/DOWN buttons. When one of the buttons is pressed, a bar graph on the left side of the display indicates the current enhancement level.
10. Camera Cable Connector Receptacle(s)	Compatible Smith & Nephew camera heads can be connected into these push-in, keyed receptacle(s). (See ORDERING INFORMATION for compatible camera heads.)

Rear Panel Controls

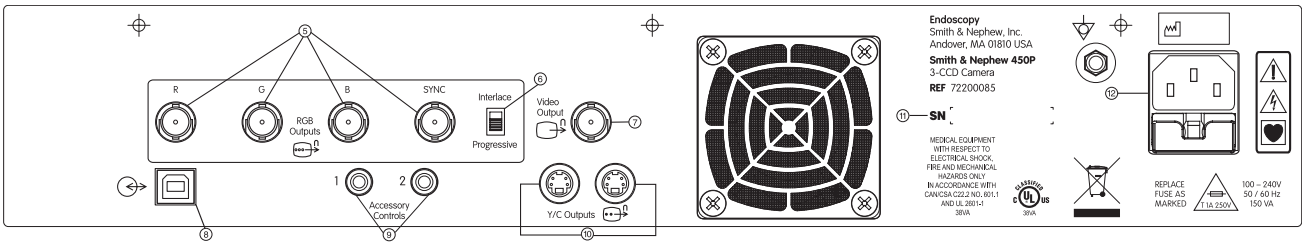


Figure 2a. Smith & Nephew 450P 3-CCD HERMES-Ready™ Camera Control Unit Rear Panel

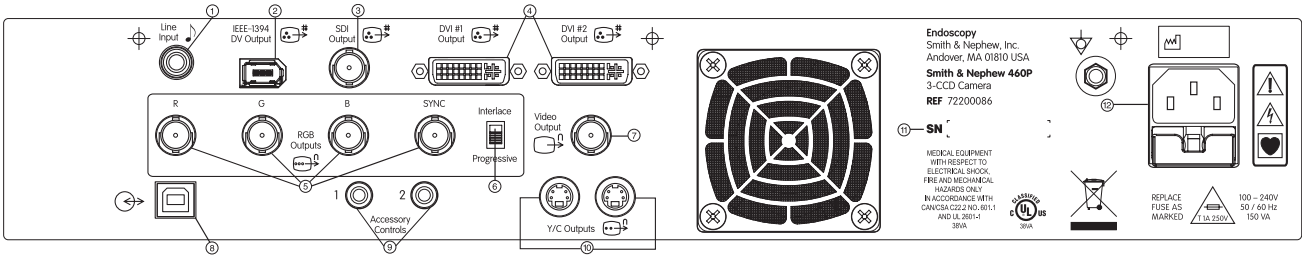


Figure 2b. Smith & Nephew 460P 3-CCD HERMES-Ready™ Camera Control Unit Rear Panel

Control	Function
1. Audio Line Input (460P only)	An audio line input, which accepts standard RCA connectors, allows audio to be added to the DV output so users can add commentary to video clips produced from the camera DV output. The rear panel audio line input and front panel MICROPHONE input may be used simultaneously.
2. DV Output (460P only)	This output provides compressed digital video per the IEEE-1394 standard. The DV output also includes the ability to add audio input from the MICROPHONE input on the CCU front panel or from the Audio Line input on the rear panel.
3. SDI Output (460P only)	This Serial Digital Interface (SDI) with 4:2:2 component digital video output is for SDI-compatible video displays or video transmission equipment.

Rear Panel Controls (continued)

Control	Function
4. DVI Outputs (460P only)	There are two digital visual interface outputs for DVI compatible digital displays. The DVI connectors support DVI-D (DVI-Digital) single-link interfaces.
5. RGB and SYNC	There are four BNC connectors for RGB-SYNC Output. This output is an interlaced or progressive analog output depending on the setting of the "Interlace/Progressive" switch.
6. Interlace/Progressive Modes Switch	The camera heads and camera control units' video outputs run in either Interlace or Progressive mode depending on the camera head, the type of video output selected, and the position of the RGB Interlace/Progressive switch.
7. Video Output	This port supplies composite video output.
8. Bidirectional Communication Port	This port enables communication with a HERMES® Digital O.R. Control Center for voice control of camera control unit functions.
9. Accessory Controls	These two outputs allow control from the camera head buttons to video accessories. They are labeled 1 (Switch #1) and 2 (Switch #2).
10. Y/C Output (2)	This video output is a standard Y/C (S-Video or S-VHS) analog output for video accessories that use Y/C (S-Video) signals, such as S-VHS VCRs and Y/C monitors.
11. Serial Number	This factory-assigned number uniquely identifies your equipment and is required for use in warranty claims.
12. Power Receptacle	This receptacle accepts a standard connector from a hospital-grade power cord.

Camera Head Controls

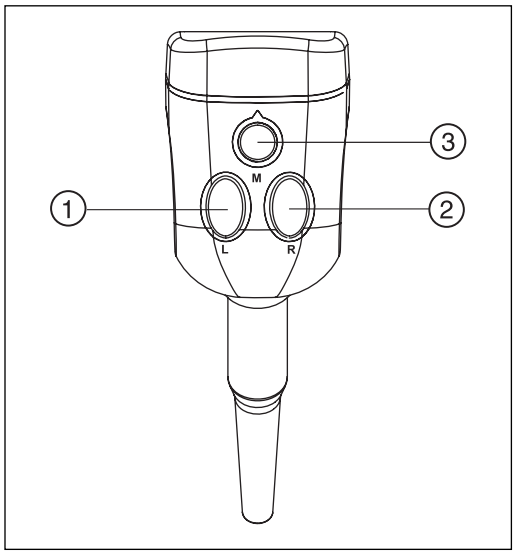


Figure 3a. Smith & Nephew 460H Three-Button Camera Head

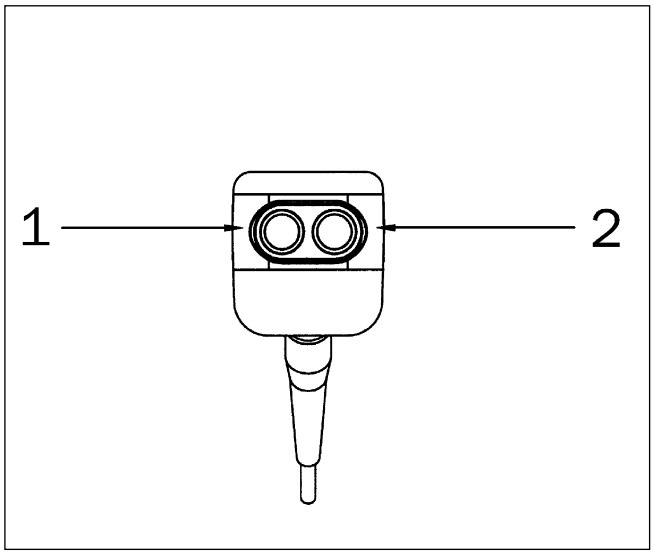


Figure 3b. Smith & Nephew ED-3 Two-Button Camera Head

460H and Ed-3 Camera Head Control	Function
1. Left Camera Head Button	When the OSD (on-screen display) menu is present, pressing this button will move the cursor up. Pressing the left button when the OSD menu is not present permits the user to access shortcuts without going to the OSD menu. In this case, the default or assigned function is executed immediately. Refer to the Instructions for Use for the applicable camera control unit on how to customize the button shortcuts.
2. Right Camera Head Button	When the OSD menu is present, pressing this button will move the cursor down. Pressing the right button when the OSD menu is not present permits the user to access shortcuts without going to the OSD menu. In this case, the default or assigned function is executed immediately. Refer to the Instructions for Use for the applicable camera control unit on how to customize the button shortcuts.
3. Middle Camera Head Button	When the OSD menu is present, pressing this button will select the highlighted menu choice or go to the previous menu or the top-level menu. Pressing the middle button when the OSD menu is not present permits the user to access shortcuts without going to the OSD menu. In this case, the default or assigned function is executed immediately. Refer to the Instructions for Use for the applicable camera control unit on how to customize the button shortcuts.

Camera Head Controls (continued)

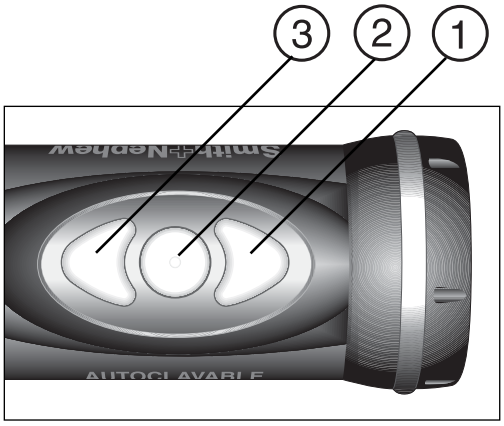


Figure 4. Smith & Nephew 470H Three-Button Camera Head

Control	Function
1. Top Button (MENU Button UP)	The Top button function is set to control certain camera settings and functions using the OSD Menu. Buttons can also be used to navigate through the OSD Menu.
2. Middle Button (MENU Button SELECT)	The Middle button can be used to select menu choices, or to select EXIT options once the top-level OSD Menu is called up via the front panel SELECT button. Buttons may also be set to control certain camera settings and functions.
3. Bottom Button (MENU Button DOWN)	The Bottom button function is set to control certain camera settings and functions using the OSD Menu. Buttons can also be used to navigate through the OSD Menu.

Prepare the Camera Head

Sterilize and disinfect the camera head following the Cleaning and Sterilization procedure enclosed with the camera head. Once this is complete, remove the cap from the camera cable connector and ensure that no moisture remains on the camera cable connector pins. Let the pins air dry if they are damp.

Inspect the System Components

This inspection ensures optimal performance as well as safe operation of the equipment.

Light Source

Verify that the light source is producing the correct amount of light. Factors that can affect the light output include:

- Improper bulb placement
- Blown fuses and/or thermocouples
- Worn-out or burned-out bulbs

Refer to the manufacturer's Operations Manual if you suspect problems with the light source.

Electrical Connections

Examine the electrical connections:

- Electrocautery and other electrical noise-inducing medical equipment can interfere with the performance of camera control units and monitors. To prevent interference, plug monitors and camera equipment into an outlet on a wall separate from noise-inducing equipment.
- Check that the electrical equipment is properly grounded (i.e., plugs contain a ground prong). The camera must be plugged into a hospital-grade AC outlet.
- If the monitor has a termination switch, it needs to be set to 75 Ω (ohms). If two or more monitors are used, only the termination switch on the last monitor needs to be ON.
- Double check the equipment setup diagrams to ensure that all connections are correct.

Cable Connectors

The 450P and 460P CCUs use the following types of cables: BNC coaxial cables, S-VHS cables which have a 4-pin mini-DIN connector, IEEE-1934 connectors, DVI connectors, and USB 2.0 style connectors. Figure 5 explains how to use these video cable connectors.

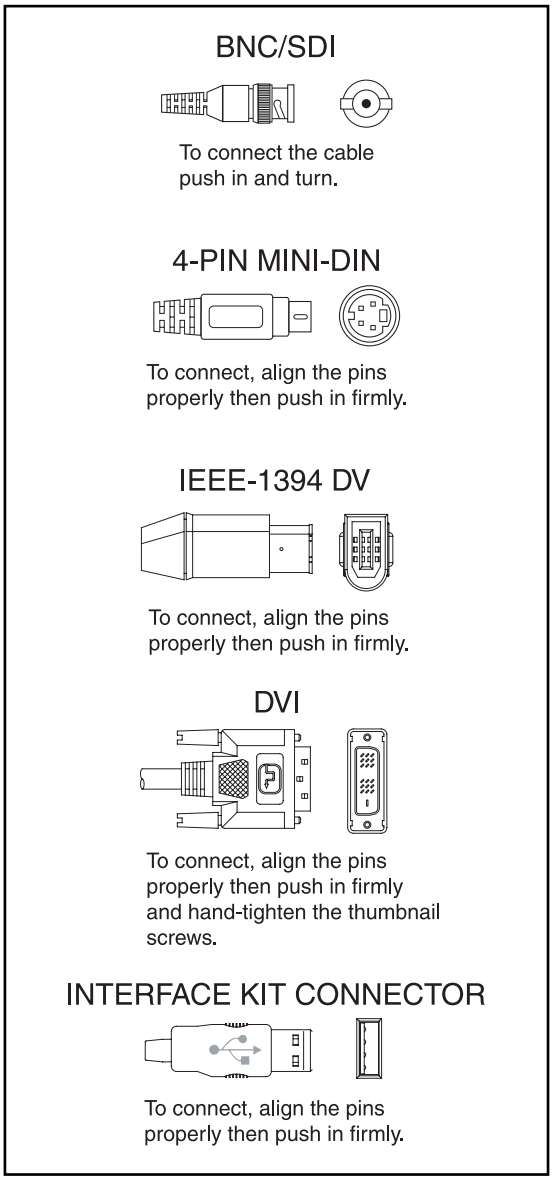

BNC/SDI
To connect the cable push in and turn.
4-PIN MINI-DIN
To connect, align the pins properly then push in firmly.
IEEE-1394 DV
To connect, align the pins properly then push in firmly.
DVI
To connect, align the pins properly then push in firmly and hand-tighten the thumbnail screws.
INTERFACE KIT CONNECTOR
To connect, align the pins properly then push in firmly.

Figure 5. Video Cable Connectors

Connect the Camera Head

Remove the protective cap from the camera cable connector. Connect the camera cable to the CCU by aligning the red dot at the end of the camera cable connector with the red dot on the CCU camera cable receptacle and push in firmly (Figure 6).

Note: If you are unfamiliar with cable connectors, see the Equipment Setups section. Also see the Equipment Setups section for diagrams of equipment setup using an automatic light source.

Connect the Video Accessories

Install the video accessories using the diagrams in the Equipment Setups section as a guideline.

Below are some tips regarding video setup:

- When connecting video accessories (monitors, VCRs or printers) to the CCU, always connect the cables using the video camera outputs to the video inputs of the accessory equipment.
- When linking pieces of equipment in a chain, the last piece of equipment should be set in the 75 Ω or the "ON" position. If there is not a 75 Ω or "ON" switch, your equipment is self-terminating and you do not need to perform this step.
- When using monitors or printers having RGB/SYNC settings, connect the RGB/SYNC outputs on the camera directly to the RGB/SYNC inputs of the accessory monitor or printer. You should use a BNC style RGB cable because the camera's RGB/SYNC outputs are standard BNC coaxial cable connectors. Use the RGB input with the video printer for best results.
- When connecting Super VHS recorders (S-VHS), monitors or printers, connect the 4-pin mini-DIN Y/C (S-Video) connectors directly to the Y/C (S-Video) input of the accessory equipment.

Note: See the Equipment Setups section for diagrams of multiple accessory setups and configurations.

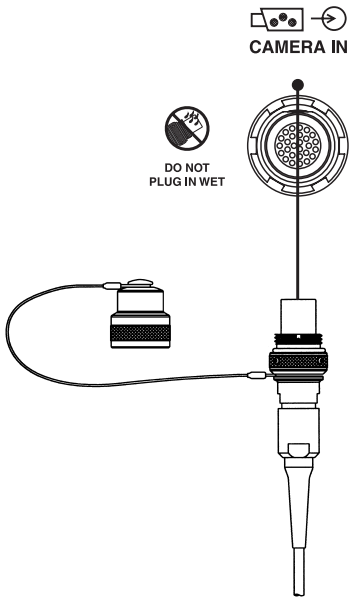


Figure 6. Camera Head Connection

Align the red dot at the end of the camera head cable connector with the red dot on the CCU camera cable receptacle and push in firmly.

IEC 60601-1-1 Compliant System Configuration

Figure 7 indicates a system configuration that complies with IEC 60601-1-1 requirements.

Warning: If this unit is configured as part of a system, the entire system should be tested for compliance with IEC 60601-1-1.

- If the leakage current of the configured system exceeds the limits of IEC 60601-1-1, install an appropriately rated UL 2601-1/IEC 60601-1 approved isolation transformer and retest the system.
- The use of accessory equipment not complying with the equivalent safety requirements of this equipment may lead to a reduced level of safety of the resulting system. Consideration relating to the choice shall include:
  - Use of the accessory in the patient vicinity.
  - Evidence that the safety certification of the accessory has been performed in accordance with the appropriate UL 2601-1/IEC 60601-1 and/or IEC 60601-1-1.

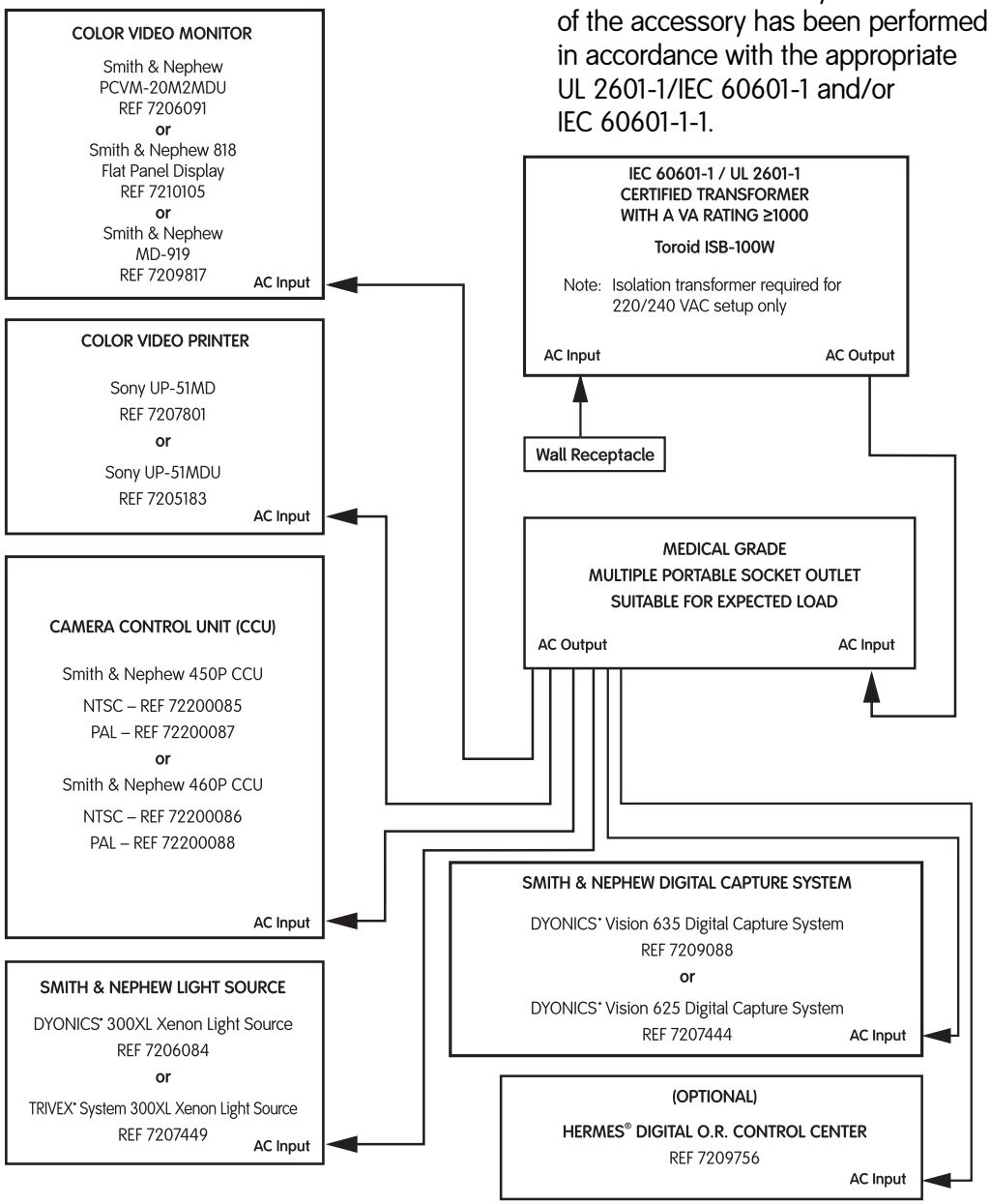


Figure 7. IEC 60601-1-1 System Configuration for 450P and 460P 3-CCD Camera Control Units

Customizing Equipment Setups

Your 450P or 460P Camera Control Units can be used with a wide variety of peripheral components to broaden the capabilities of your video system. Each individual setup is dependent on the accessory peripherals included in your video system. The following pages explain and illustrate how to set up the camera control unit and accessory equipment. Several variations of equipment configurations are presented.

Select the configuration that best meets your needs. If your individual setup configuration is not included, contact your Smith & Nephew representative for assistance in assembling your system to optimize your needs.

Setup Configurations Summary

The setup configurations listed below are illustrated in detail pages 20–29.

Note: Setup 1–3 are for both the Smith & Nephew 450P and 460P Camera Control Units. Setups 4 and 5 are applicable only for the Smith & Nephew 460P Camera Control Unit.

Setup	Equipment Used
Setup 1	450P/460P Camera Control Unit (CCU) Monitor
Setup 2	450P/460P Camera Control Unit (CCU) S-VHS VCR Monitor
Setup 3	450P/460P Camera Control Unit (CCU) Video Print Recorder (VPR) Monitor (2)
Setup 4	460P Camera Control Unit (CCU) Video Print Recorder (VPR) Monitor (2) Flat Panel Display with SDI
Setup 5	460P Camera Control Unit (CCU) Video Print Recorder (VPR) Monitor (2) Flat Panel Display with DVI

⚠ **Warning:** If this unit is configured as part of a system, the entire system should be tested for compliance with IEC 60601-1-1. If the leakage current of the configured system exceeds the limits of IEC 60601-1-1, install an appropriately rated UL 2601-1/IEC 60601-1 approved isolation transformer and retest the system.

Setup 1 - 450P/460P Camera Control Units

Equipment Used

- 450P/460P Camera Control Unit (CCU)
- Monitor

Procedure

1. Camera Control Unit

Connect the supplied hospital-grade power cord to the power receptacle on the CCU rear panel.

2. Monitor

a. One or more monitors may be connected to the available RGB, video, Y/C, DVI, and SDI output ports.

b. For RGB input, connect the supplied hospital-grade power cord to the power receptacle on the monitor.

c. Connect the supplied RGB coaxial cable from the RGB OUT port on the CCU rear panel to the RGB IN port on the monitor.

d. Press the RGB button on the monitor's front panel to get RGB picture. The use of this format will produce a picture with the best color and resolution.

e. For Y/C, connect the supplied Y/C coaxial cable from the Y/C OUT port on the CCU rear panel to the Y/C IN port on the monitor. Reserve its use as a backup safety line in the event of difficulties with the picture in RGB.

f. If the monitor has a termination switch, set it to "ON" (75 Ω) position.

g. For DVI input:

- Connect the DVI cable supplied with the LCD flat panel monitor to the DVI output port on the rear of the CCU.
- Press the input button on the front panel of the LCD monitor to select "DVI" to display the digital video.

For SDI input:

- Connect an RG-59 coaxial cable from the coaxial connecter on the rear panel to a SDI-compatible monitor.
- Press the input button on the front panel of the LCD monitor to select "SDI" to display the digital video.

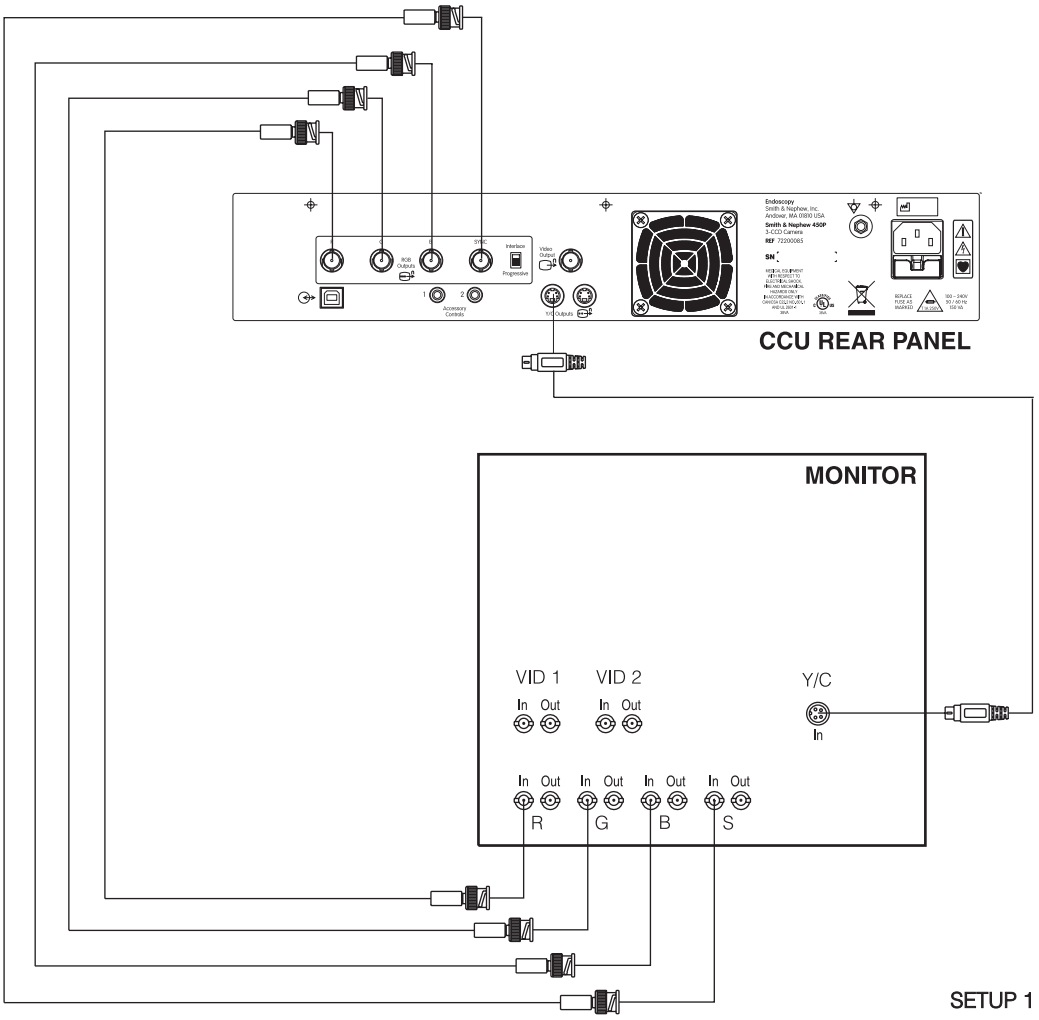
3. Digital Output Accessory

Connect the supplied IEEE-1394 4-pin cable from the IEEE-1394 DV OUT port on the CCU rear panel to the IEEE-1394 DV port on the accessory. Both a 4-pin-to-4-pin cable and a 4-pin-to-6-pin cable are provided.

4. System Setup

Following connection of all peripheral accessory components, turn the video components "ON" using the appropriate power switches.

Note: The digital output accessory may need to be turned "ON" after the camera control unit is turned on.


CCU REAR PANEL
MONITOR
VID 1
VID 2
Y/C
In Out
In Out
In
In Out In Out In Out In Out
R G B S
SETUP 1

Setup 2 - 450P/460P Camera Control Units

Equipment Used

- 450P/460P Camera Control Unit (CCU)
- S-VHS Video Cassette Recorder (VCR)
- Monitor

Procedure

1. Camera Control Unit

Connect the supplied hospital-grade power cord to the power receptacle on the CCU rear panel.

2. S-VHS VCR

a. Connect the supplied hospital-grade power cord to the power receptacle on the VCR.

b. Connect the supplied Y/C coaxial cable from the Y/C OUT port on the CCU rear panel to the VCR's Y/C IN port.

c. Connect the supplied Y/C coaxial cable from the Y/C OUT port on the S-VHS VCR rear panel to the Y/C IN port on the monitor.

d. Connect the supplied RGB coaxial cable from the RGB OUT port on the CCU rear panel to the RGB IN port on the monitor.

e. Press the RGB button on the monitor to get an RGB picture. The use of this format will produce a picture with the best color and resolution.

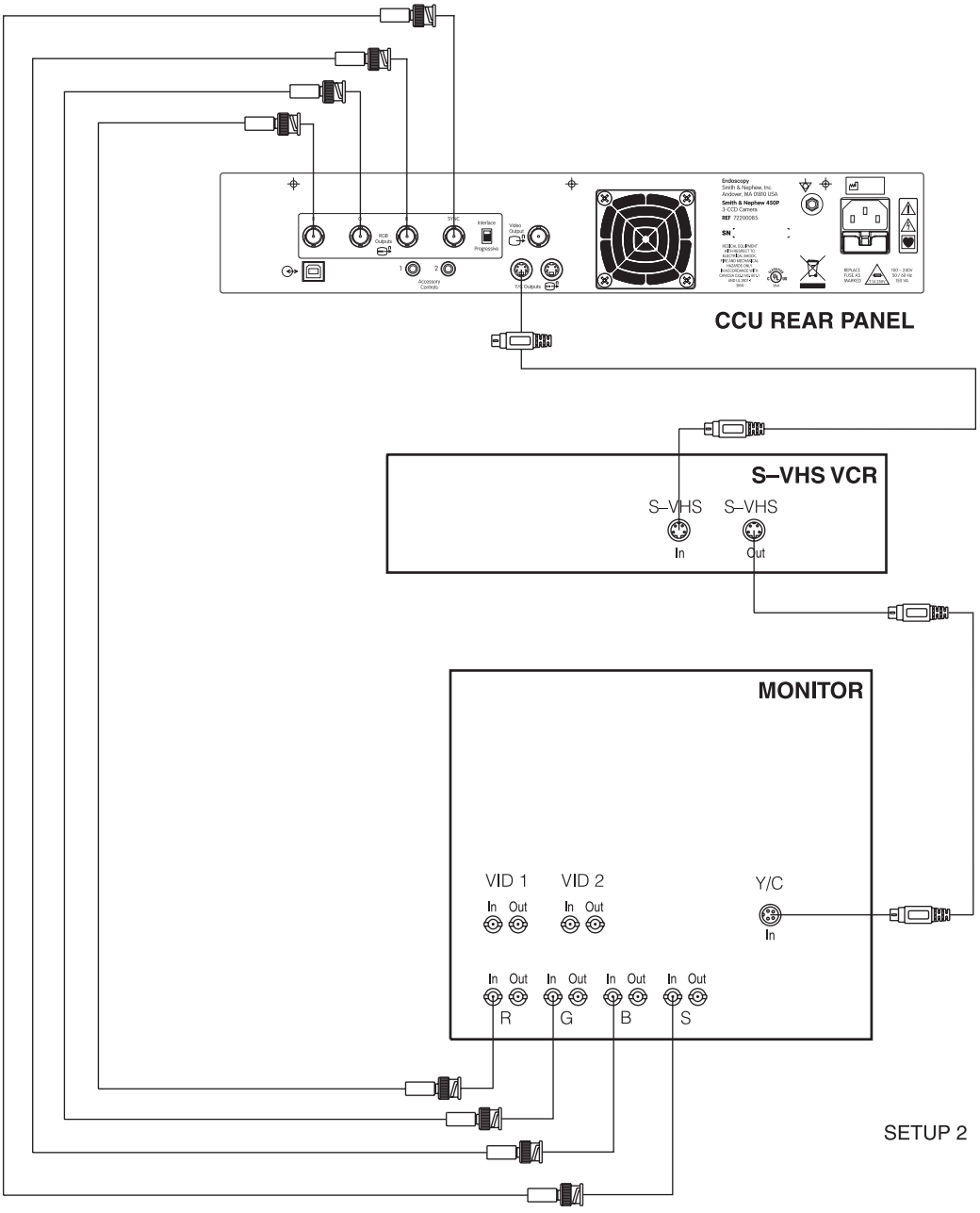
3. Monitor

a. Connect the supplied hospital-grade power cord to the power receptacle on the monitor.

b. If the monitor has a termination switch, set it to "ON" (75 Ω) position.

4. System Setup

Following connection of all peripheral accessory components, turn the video components "ON" using the appropriate power switches.


CCU REAR PANEL
S–VHS VCR
S–VHS
In
S–VHS
Out
MONITOR
VID 1
In Out
VID 2
In Out
Y/C
In
In Out
R
In Out
G
In Out
B
In Out
S
SETUP 2

Setup 3 - 450P/460P Camera Control Units

Equipment Used

- 450P/460P Camera Control Unit (CCU)
- Video Print Recorder (VPR)
- Monitor (2)

Procedure

1. Camera Control Unit

Connect the supplied hospital-grade power cord to the power receptacle on the CCU rear panel.

2. Video Print Recorder (VPR)

a. Connect the supplied hospital-grade power cord to the power receptacle on the VPR.

b. Connect the supplied RGB coaxial cable from the RGB OUT port on the CCU rear panel to the RGB IN port on the VPR.

c. Connect the supplied RGB coaxial cable from the RGB OUT port on the VPR rear panel to the RGB IN port on the monitor.

d. Press the RGB button on the monitor to get the RGB picture. The use of this format will produce a picture with the best color and resolution.

3. Monitor 1

a. Connect the supplied hospital-grade power cord to the power receptacle on the monitor.

b. Connect the supplied Y/C coaxial cable from the Y/C OUT port on the CCU rear panel to the Y/C IN port on Monitor 1. Use this Y/C Monitor configuration in the event of difficulties with picture in RGB.

c. If the monitor has a termination switch and you are using two monitors, set the first monitor (Monitor 1) termination switch to the “OFF” position and the second monitor (Monitor 2) termination switch to the “ON” (75 Ω) position. If you are using one monitor only, set the monitor termination switch to the “ON” position.

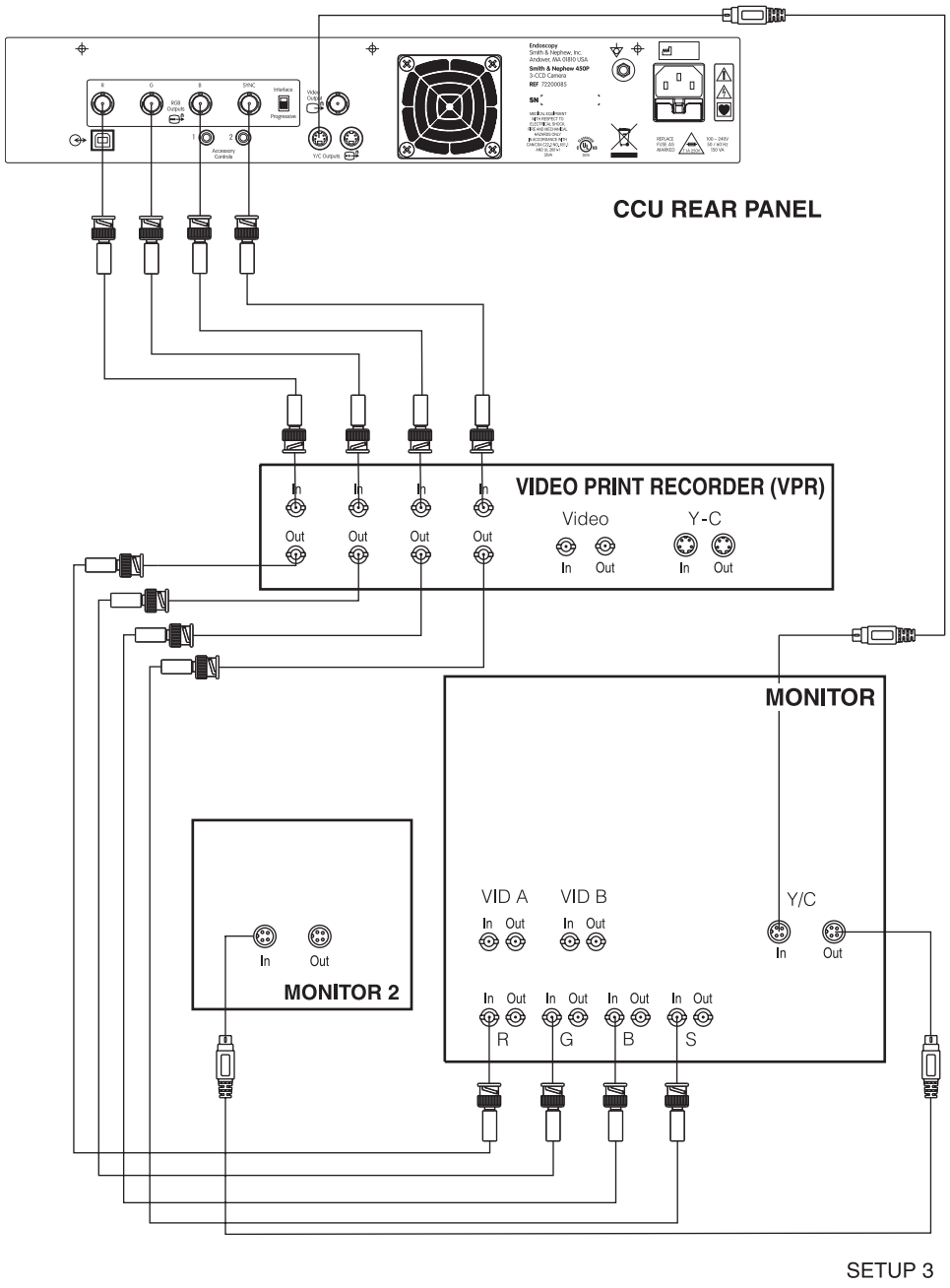
4. Monitor 2

a. Optional: Connect the Y/C coaxial cable from the Y/C Video OUT port on the Monitor 1 rear panel to the Y/C Video IN port on Monitor 2.

b. If Monitor 2 has a termination switch, set it to the “ON” (75 Ω) position and set the Monitor 1 termination switch to the “OFF” position.

5. System Setup

Following connection of all peripheral accessory components, turn the video components “ON” using the appropriate power switches.


CCU REAR PANEL
VIDEO PRINT RECORDER (VPR)
In
Out
Video
Y-C
MONITOR
MONITOR 2
VID A
VID B
Y/C
R
G
B
S

SETUP 3

Setup 4 - 460P Camera Control Units

Equipment Used

- 460P Camera Control Unit (CCU)
- Video Print Recorder (VPR)
- Monitor (2)
- Flat Panel Display with SDI

Procedure

1. Camera Control Unit

Connect the supplied hospital-grade power cord to the power receptacle on the CCU rear panel.

2. Video Print Recorder (VPR)

a. Connect the supplied hospital-grade power cord to the power receptacle on the VPR.

b. Connect the supplied RGB coaxial cable from the RGB OUT port on the CCU rear panel to the RGB IN port on the VPR.

c. Connect the supplied RGB coaxial cable from the RGB OUT port on the VPR rear panel to the RGB IN port on the monitor.

d. Press the RGB button on the monitor to get the RGB picture. The use of this format will produce a picture with the best color and resolution.

3. Monitor 1

a. Connect the supplied hospital-grade power cord to the power receptacle on the monitor.

b. Connect the supplied Y/C coaxial cable from the Y/C OUT port on the CCU rear panel to the Y/C IN port on Monitor 1. Use this Y/C Monitor configuration in the event of difficulties with the picture in RGB.

c. If the monitor has a termination switch and you are using two monitors, set the first monitor (Monitor 1) termination switch to the "OFF" position and the second monitor (Monitor 2) termination switch to the "ON" (75 Ω) position. If you are using one monitor only, set the monitor termination switch to the "ON" position.

d. For SDI input:

- Connect an RG-59 coaxial cable from the coaxial connecter on the rear panel to an SDI-compatible monitor.
- Press the input button on the front panel of the LCD monitor to select "SDI" to display the digital video.

4. Monitor 2

a. Optional: Connect the Y/C coaxial cable from the Y/C Video OUT port on the Monitor 1 rear panel to the Y/C Video IN port on Monitor 2.

b. If Monitor 2 has a termination switch, set it to the "ON" (75 Ω) position and set the Monitor 1 termination switch to the "OFF" position.

5. Flat Panel Display with SDI

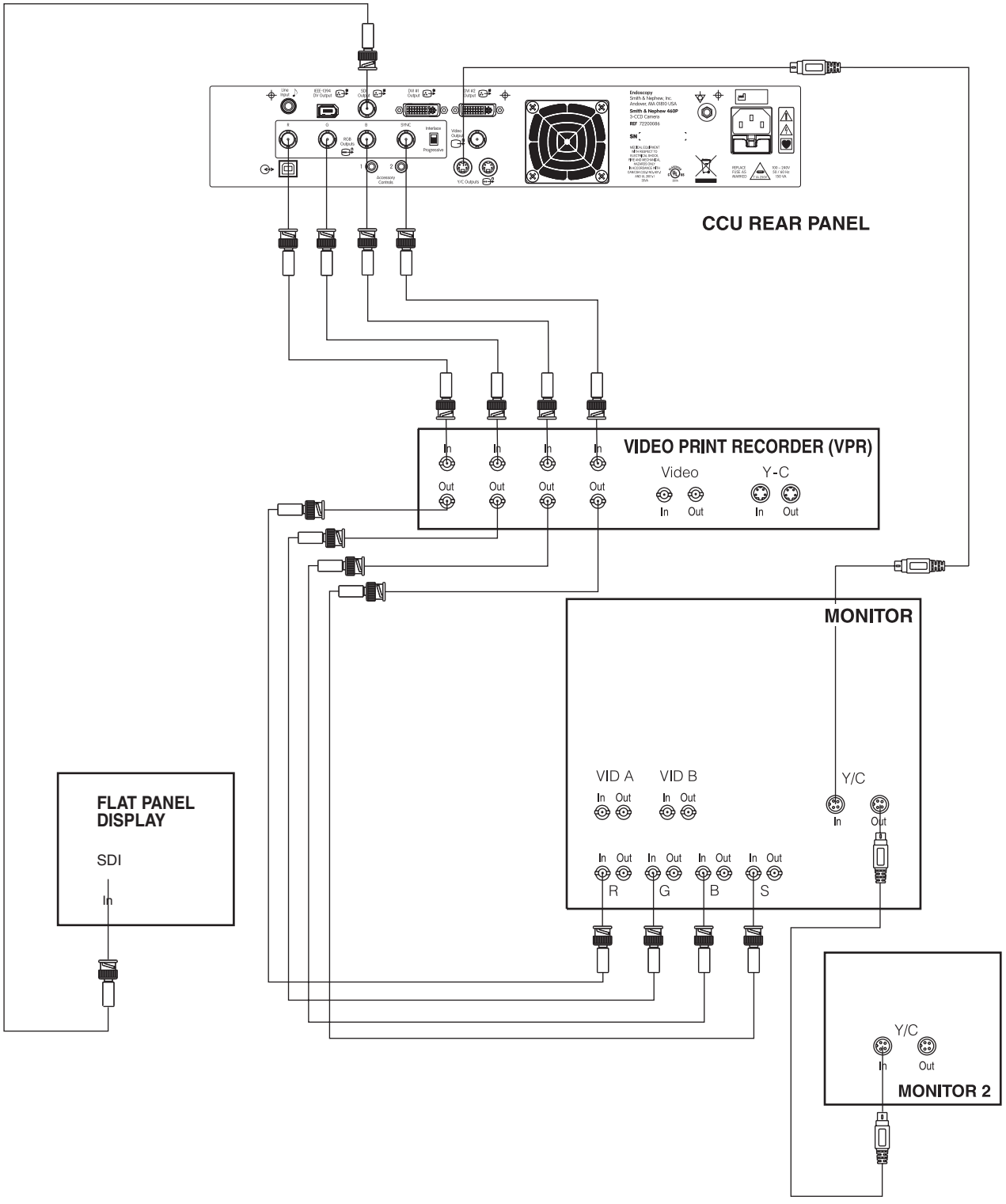
a. Connect the supplied hospital-grade power cord to the power receptacle on the monitor.

b. Connect a BNC style coaxial cable from the SDI Output of the camera to the SDI Input on the monitor.

c. Select the SDI Input on the monitor.

6. System Setup

Following connection of all peripheral accessory components, turn the video components "ON" using the appropriate power switches.


CCU REAR PANEL
VIDEO PRINT RECORDER (VPR)
In
Out
Video
Y-C
MONITOR
VID A
VID B
Y/C
R
G
B
S
FLAT PANEL DISPLAY
SDI
In
MONITOR 2

SETUP 4

Setup 5 - 460P Camera Control Units

Equipment Used

- 460P Camera Control Unit (CCU)
- Video Print Recorder (VPR)
- Monitor (2)
- Flat Panel Display with DVI

Procedure

1. Camera Control Unit

Connect the supplied hospital-grade power cord to the power receptacle on the CCU rear panel.

2. Video Print Recorder (VPR)

a. Connect the supplied hospital-grade power cord to the power receptacle on the VPR.

b. Connect the supplied RGB coaxial cable from the RGB OUT port on the CCU rear panel to the RGB IN port on the VPR.

c. Connect the supplied RGB coaxial cable from the RGB OUT port on the VPR rear panel to the RGB IN port on the monitor.

d. Press the RGB button on the monitor to get the RGB picture. The use of this format will produce a picture with the best color and resolution.

3. Monitor 1

a. Connect the supplied hospital-grade power cord to the power receptacle on the monitor.

b. Connect the supplied Y/C coaxial cable from the Y/C OUT port on the CCU rear panel to the Y/C IN port on Monitor 1. Use this Y/C Monitor configuration in the event of difficulties with the picture in RGB.

c. If the monitor has a termination switch and you are using two monitors, set the first monitor (Monitor 1) termination switch to the "OFF" position and the second monitor (Monitor 2) termination switch to the "ON" (75 Ω) position. If you are using one monitor only, set the monitor termination switch to the "ON" position.

d. For DVI input:

- Connect the DVI cable supplied with the LCD flat panel monitor to the DVI output port on the rear of the CCU.
- Press the input button on the front panel of the LCD monitor to select "DVI" to display the digital video.

4. Monitor 2

a. Optional: Connect the Y/C coaxial cable from the Y/C Video OUT port on the Monitor 1 rear panel to the Y/C Video IN port on Monitor 2.

b. If Monitor 2 has a termination switch, set it to the "ON" (75 Ω) position and set the Monitor 1 termination switch to the "OFF" position.

5. Flat Panel Display with DVI

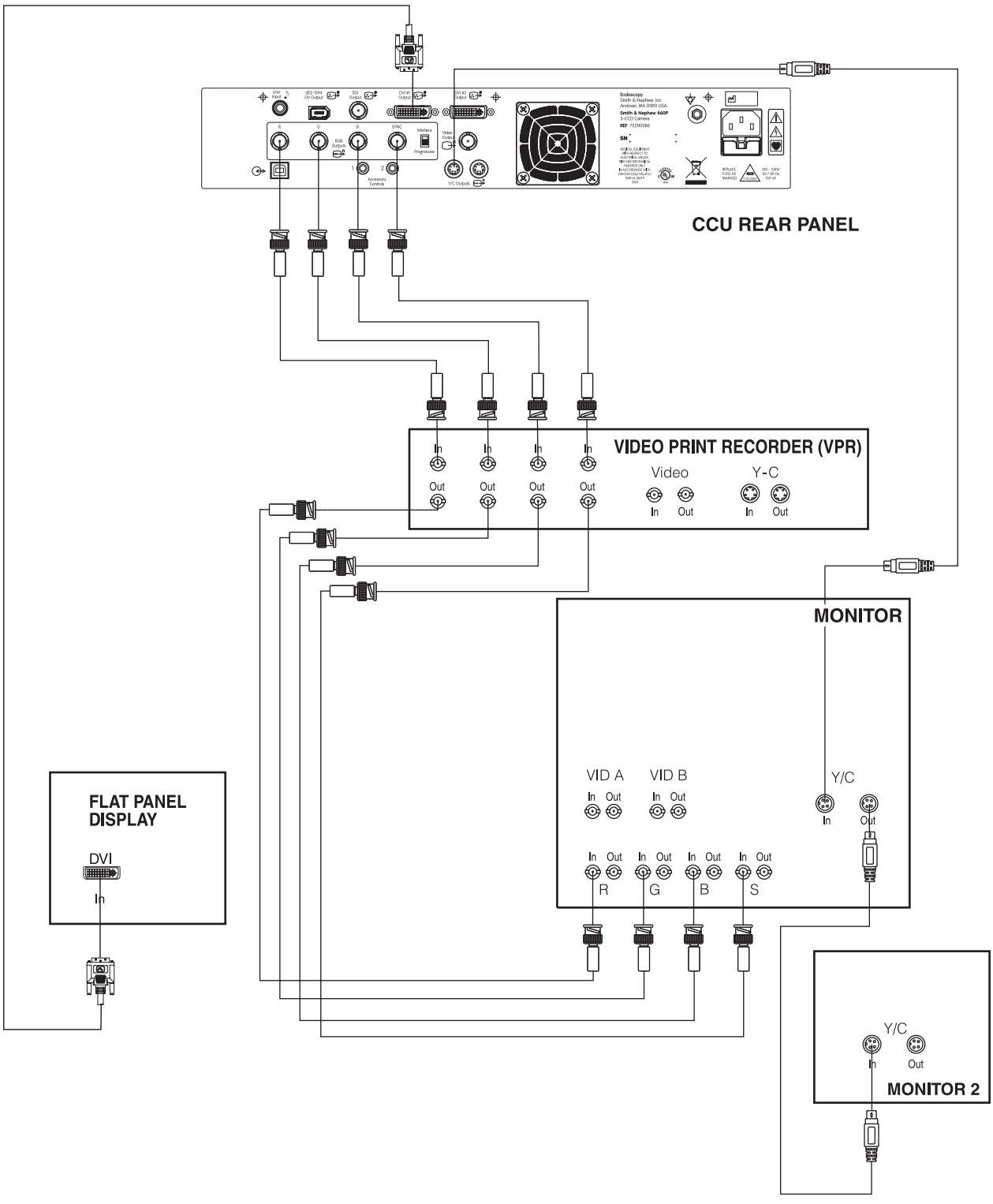
a. Connect the supplied hospital-grade power cord to the power receptacle on the monitor.

b. Connect a DVI style cable from the DVI Output of the camera to the DVI Input on the monitor.

c. Select the DVI Input on the monitor.

6. System Setup

Following connection of all peripheral accessory components, turn the video components "ON" using the appropriate power switches.


CCU REAR PANEL
VIDEO PRINT RECORDER (VPR)
In
Out
Video
Y-C
MONITOR
VID A
VID B
Y/C
R
G
B
S
FLAT PANEL DISPLAY
DVI
MONITOR 2

SETUP 5

Turn the Camera On

1. Plug the female end of the power cord into the power receptacle on the CCU rear panel.
2. Verify that the power outlet corresponds to the data on the rear panel label and that the third pin on the plug is properly grounded.
3. Plug the power plug into a hospital-grade AC power outlet.
4. Turn the power switch on the CCU front panel "ON." The power switch will illuminate green and color bars will appear on the monitor screen.

Note: Color bars will not appear if the camera head is already plugged into the CCU.

Reminder: Use a hospital-grade AC power outlet.

Adjust the Monitor to the Color Bars

Color bars are used to test and adjust the color on the monitor to the desired contrast, sharpness and color levels.

1. Turn the monitor power "ON."
2. Color bars will display on the monitor.
3. Set the monitor display to the desired viewing levels by adjusting the contrast, sharpness and color levels. If the monitor has a Reset button, pressing the Reset button to adjust the colors to the factory setting will often produce the desired quality.

Note: If you have trouble adjusting the colors on the monitor, review the following information on adjusting color monitors.

Tips for Adjusting Color Monitors

- Connect your monitor in accordance with its instruction manual, setting the termination switch as explained in the "Electrical Connections" section.
- Begin with contrast (picture) and brightness controls in the middle or mid-detent position. Adjust brightness slightly so that darker parts of the image are visible but not "milky" or washed out.
- Set the contrast so that the overall image brightness is desirable. In most cases, contrast set to 50% or higher is preferable.

  Note: Long-term use with the contrast set too high will reduce the life of the monitor.
- Y/C color saturation is adjusted with the chroma (color) adjustment knob or button. Decreasing this setting will reduce the amount of overall color perceived in the image. In the fully decreased position, the image will be black and white. Too much color saturation makes the image uncomfortable to view and the colors will appear noisy or smeared.
- Y/C hue is adjusted using the hue (tint or phase) knob or button. Adjust the hue until good color is achieved.

Note: Most monitors can be reset to the factory settings by setting the control knobs to center or, on some monitors, by pressing the Reset button on the front panel.

Confirm Attachment of Coupler/ Videoendoscope to Camera

The 450P and 460P 3-CCD Camera Control Units are designed to be used with instruments such as a videolaparoscope, videoarthroscope, or lens coupler.

1. Attach a videoscope, or coupler with direct-view endoscope to the camera head.
2. Attach the fiber optic light guide from the automatic light source to the scope.

White Set the Camera

The WHITE SET button allows you to make corrections for color differences from light sources or attached scopes. The white set procedure should be followed prior to each and every operative procedure to ensure proper color rendition. To white set the camera, use the following steps. The scope and the fiber optic light guide should already be connected as explained above.

1. Insert the camera cable into the receptacle on the front panel. A live video image will display on the monitor.
2. Point the end of the scope at a white object (a 4 x 4 gauze pad or flat white piece of paper), focus, and press the WHITE SET button on the CCU front panel. Fill as much of the screen as possible with the white object but do not hold the scope close enough to touch the white object. The words “White Set in Progress” will appear on the monitor.
3. Hold the gauze pad or paper in front of the scope until the words “White Set Complete” are displayed on the monitor.

Note: If the message “White Set Incomplete” is shown on the monitor screen, the white set procedure must be performed again. This may be due to poor lighting conditions.

Focus the scope on a white object until the words “White Set Complete” are displayed on the monitor.

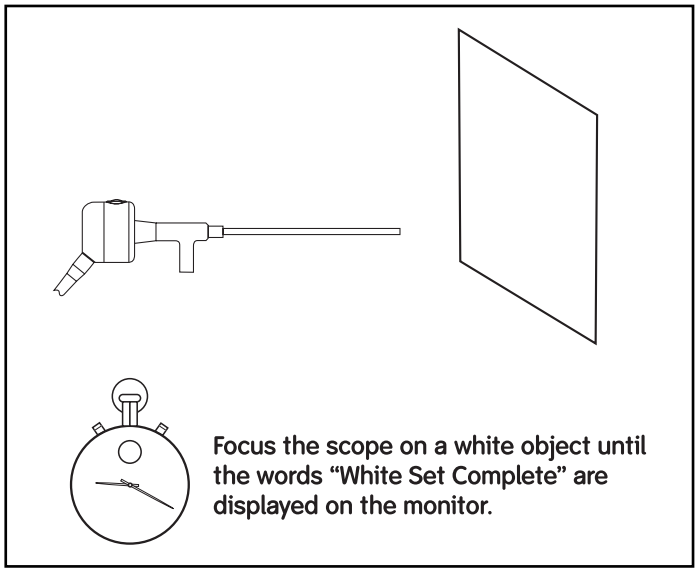


Figure 8. White Setting the Camera

Camera Control Menus

The 450P/460P CCUs (Camera Control Units) have been configured to meet your specific digital imaging visualization needs. Users may control the camera by pushing the buttons on the front panel of the CCU and/or the buttons on the camera head.

An OSD (On-Screen Display) Menu using video overlay characters shows prompts, visual feedback, menu structure, or error messages on the primary surgical display screen.

Buttons on the CCU front panel allow one-button operation of the most frequently used camera control functions: WHITE SET, BRIGHTNESS, ENHANCEMENT, and PROCEDURE. In addition, the three general-purpose menu control buttons – UP, SELECT, and DOWN – allow users to select or program other camera functions. The front panel controls are illustrated in Figures 1a through 1c.

The buttons on the camera head can be operated in two different modes. When the OSD Menu is not displayed on the screen, each of the camera head buttons is assigned to one single camera function.

For three-button camera heads: the TOP, MIDDLE, and BOTTOM buttons are assigned to three preprogrammed functions. The preprogrammed functions may be assigned using the BUTTON SETUP Menu (beginning on page 38).

When the OSD Menu is displayed on the screen, the camera head button functions are the SELECT, UP, and DOWN buttons described in the next section.

SELECT Button

The SELECT button on the CCU front panel will call-up the top level OSD Menu.

Once the top level OSD Menu is displayed on the screen, the TOP and BOTTOM buttons on the three-button camera heads may be used to move the cursor up and down to select the menu choice. The MIDDLE button of a three-button camera head may also be used to SELECT the highlighted menu choice or to go to the previous menu or to access the top-level menu. With a two-button camera head, this feature is not enabled, and the LEFT and RIGHT buttons will remain in the default state selected in the BUTTON SET-UP Menu.

WHITE SET is the default choice when the OSD Menu is first accessed. Pressing the SELECT button on the CCU front panel or the MIDDLE button of a three-button camera head will start the WHITE SET process.

Pressing the SELECT button on other highlighted menu choices except EXIT will bring up a sub-menu associated with the selected function.

Pressing the SELECT button when EXIT is highlighted will dismiss the OSD Menu.

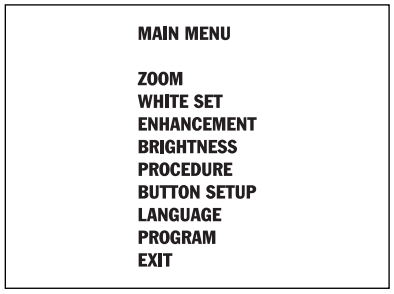
UP and DOWN Buttons

If either the UP or DOWN button on the CCU front panel, or any one of the buttons on a three-button camera head is depressed without first pressing the SELECT button on the front panel, and the OSD Menu is not present on the screen, the functions assigned by the BUTTON SETUP Menu (beginning on page 38) will be executed.

If the SELECT button is first pressed, causing the OSD Menu to appear, pressing the UP or DOWN buttons on the front panel, the TOP or BOTTOM buttons on the three-button camera head will cause the cursor to scroll through the available menu selections. When the end of a menu is reached, the next UP or DOWN button activation will bring the user either to the top of the menu or the bottom of the menu.

Camera Control Menus (continued)

Menus and Sub-Menus



The OSD supports the following menus and sub-menus.

These are explained in further detail in subsequent sections. If an OSD Menu or sub-menu is displayed for five seconds with no button activity, the OSD Menu or sub-menu is dismissed with no further change to the camera settings. Unless otherwise noted, the menu entries are supported by both the 450P and 460P CCUs. The underlined menu items are the default choices.

- **ZOOM (460P CCU only)**
- **WHITE SET**
- **ENHANCEMENT**
- **BRIGHTNESS**
- **PROCEDURE**
  - ARTHROSCOPY
  - LAPAROSCOPY
  - CYSTOSCOPY
  - ENT
  - CUSTOM 1
  - CUSTOM 2
  - FLEXIBLE SCOPE FILTER A
  - FLEXIBLE SCOPE FILTER B
  - MAIN MENU
- **BUTTON SETUP**
  - LEFT/TOP
  - RIGHT/BOTTOM
  - MIDDLE
  - MAIN MENU
- **LANGUAGE**
  - ENGLISH
  - DEUTSCH
  - ESPAÑOL
  - FRANÇAIS
  - ITALIANO
  - SVENSKA
  - NEDERLANDS
  - JAPANESE
  - MAIN MENU
- **PROGRAM**
  - CAMERA SETTINGS
    - o ELECTRONIC LIGHT CONTROL
      - AUTO
      - MANUAL
    - o ELC PEAK/AVG
      - 1 - 8
    - o LIGHT MEASUREMENT AREA
      - FULL
      - CENTER
      - SMALL CIRCLE
      - MEDIUM CIRCLE
      - LARGE CIRCLE
      - AUTOMATIC
    - o SENSITIVITY
      - NORMAL
      - LOW LIGHT
    - o BLACK SET

Camera Control Menus (continued)

- o BRIGHTNESS
- o WHITE SHADING
  - AUTO
  - MANUAL
- o COLOR
  - RED
    - HUE
    - SATURATION
    - FACTORY DEFAULT
  - BLUE
    - HUE
    - SATURATION
    - FACTORY DEFAULT
  - GREEN
    - HUE
    - SATURATION
    - FACTORY DEFAULT
  - CYAN
    - HUE
    - SATURATION
    - FACTORY DEFAULT
  - MAGENTA
    - HUE
    - SATURATION
    - FACTORY DEFAULT
  - YELLOW
    - HUE
    - SATURATION
    - FACTORY DEFAULT
  - FACTORY DEFAULT
  - PREVIOUS MENU
- o DYNAMIC RANGE
  - GAMMA
    - OFF
    - LOW
    - NORMAL
    - HIGH
  - AUTO KNEE
    - OFF
    - ON
  - PRE-KNEE
    - OFF
    - ON
  - FLARE COMPENSATION
    - OFF
    - ON
  - BLACK STRETCH
    - OFF
    - ON
- o FACTORY DEFAULT
- o PREVIOUS MENU

– SAVE SETTINGS AS CUSTOM1

– SAVE SETTINGS AS CUSTOM2

– RESTORE FACTORY CUSTOM1 SETTINGS

– RESTORE FACTORY CUSTOM2 SETTINGS

– MAIN MENU

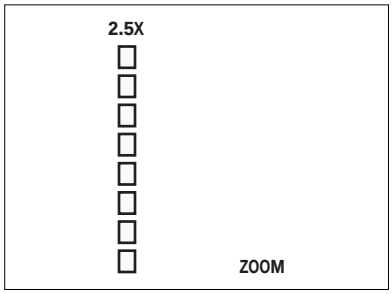
- **EXIT**

Camera Control Menus (continued)

Zoom (460P CCU Only)

When the cursor is placed over the ZOOM function, and the middle SELECT button on the camera head is depressed, the zoom function is assigned temporarily to the UP and DOWN buttons until the SELECT button is pressed again.

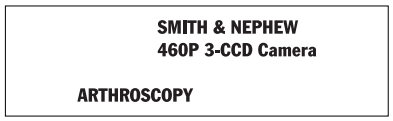
When an UP or DOWN button is depressed continuously, the image will scale from 1.0X to 2.5X in approximately 3.5 seconds. During this time, the OSD will display a zoom barometer along with the value of the zoom factor in increments of 0.1X on the left-hand side of the image. When either the minimum or maximum scale factor is reached, the zoom action will stop and remain at that value. After five seconds of inactivity, the OSD zoom barometer and zoom factor will disappear.



When the SELECT button is pressed again, the main OSD Menu is displayed on the screen. The UP and DOWN buttons revert to the assignment selected in the BUTTON SETUP menu.

Power-Up Initialization

On power-up, a startup screen appears on the surgical display screen with the camera model name and the currently selected surgical procedure name. The startup screen remains on the display for five seconds. Afterwards, the screen displays either live video or a color bar pattern, depending on whether or not a camera head is plugged in.



If the camera head is plugged into the control unit when the power is turned on, a live video will be displayed, along with a prompt to perform a White Set. This same functionality occurs for each head of a dual-head camera control unit.

If the camera head is not plugged in, or if the camera head is unplugged while the control unit is on, a color bar pattern will be displayed.

In the color bar mode, the currently selected PROCEDURE name may be called up or changed by pressing the PROCEDURE button on the front panel.

When a camera head is plugged in while the color bar is displayed, the control unit switches to live video, and a prompt to white set will again be displayed.

White Set Menu

When the White Set menu is selected, or every time power is first applied to the CCU, an on-screen prompt “PRESS ANY BUTTON TO WHITE SET” appears.

When viewing a neutral white object, the user can activate the process either by pressing the front panel WHITE SET button or by using any camera head button. While the camera is performing the White Set, a flashing message “WHITE SET IN PROGRESS” is displayed on the screen.

Camera Control Menus (continued)

The White Set process is successful (complete) if the process has been started with sufficient light and when the Red, Green and Blue signal levels have been equalized (in Y/C output, when the amplitude of the chroma signal is minimized). A brief message "WHITE SET COMPLETE" is displayed for three seconds to indicate that the process has been completed.

If there is not sufficient light for the camera to perform White Set after the process has started, the camera displays the message "WHITE SET INCOMPLETE".

This message is only displayed when White Set failure occurs as a result of too little light. "WHITE SET INCOMPLETE" will not be displayed if the camera fails to White Set because the image is out of color temperature range or if there is too much light. This error message will remain on the screen for five seconds. The user should then restart the White Set process using any camera head or CCU button. If the user decides not to perform White Set again, or if a hardware error precludes successful White Set completion, then after five seconds the error message disappears and the user may continue.

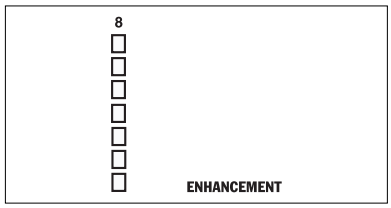
The White Set process is executed in approximately one second. If the camera head is removed while CCU power is on and then reinserted into the CCU, the white set message "PRESS ANY BUTTON TO WHITE SET" appears again and the process must be repeated.

Enhancement

When the cursor is placed over ENHANCEMENT, and the middle SELECT button on a three-button camera head is depressed, the ENHANCEMENT function is assigned temporarily to the TOP and BOTTOM buttons until the SELECT button is pressed again.

ENHANCEMENT refers to application of one or more spatial filters to sharpen or soften the image to provide a more pleasing visualization effect. In some cases, this may involve the application of a progressively sharper edge enhancement filter. In other cases such as when the digital zoom is employed, or when imaging under low light conditions, a low pass filter is applied to suppress high frequency noise or spatial artifacts.

When ENHANCEMENT is selected, the screen will display a barometer bar with a numerical value.



Pressing the UP button should introduce increasingly more pronounced edge sharpening and contrast enhancement filters. Pressing the DOWN button will result in less contrast. Each ENHANCEMENT setting is represented internally by a combination of factory set default parameters.

Camera Control Menus (continued)

ENHANCEMENT is not selectable if Flexible Scope Filter has been turned on, in order not to accentuate the “chicken wire” or Moire effect of the fiberscope. If the user attempts to select it in this condition, an “Error” tone will sound and the message “ENHANCEMENT UNAVAILABLE WITH FLEXIBLE SCOPE FILTER” will be displayed.

The effect of ENHANCEMENT is not permanent. When a user adjusts the ENHANCEMENT level, the Detail Level setting associated with the current PROCEDURE setting is overridden in RAM only. On first selecting ENHANCEMENT, the Detail Level setting will start at the default level associated with the current PROCEDURE setting. From this starting point the ENHANCEMENT may then be adjusted up or down. All other parameters associated with the PROCEDURE settings remain intact. On the next power-up, ENHANCEMENT reverts to the default settings associated with the default procedure.

After five seconds of inactivity, the OSD disappears. When the ENHANCEMENT level reaches either a maximum or minimum, further UP or DOWN button activation will introduce no further change.

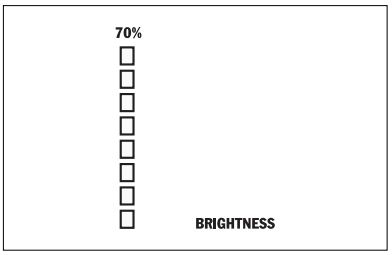
When the SELECT button is pressed again, the main OSD Menu is displayed on the screen. The UP and DOWN buttons revert to the assignment selected in the BUTTON SETUP menu.

The ZOOM factor always defaults to 1.0 on power up.

Brightness

When the cursor is placed over BRIGHTNESS, and the middle SELECT button on the camera head is pressed, the BRIGHTNESS function is assigned temporarily to the UP and DOWN buttons until the SELECT button is pressed again.

Brightness refers to the luminance level of the video output set by the Electronic Light Control (ELC) circuitry of the camera. The target luminance level provides the feedback signal to the ELC circuitry to adjust the automatic shutter (integration time), electronic gain or the light output of the external light source. User modification of BRIGHTNESS during surgery can be useful when the surgeon wants to see the parts of an image that are normally dark, such as a recess in a knee. When the BRIGHTNESS menu is selected, the following screen will appear:



A barometer with a numerical value from 0 to 100% in 10 steps will move up or down in response to the UP or DOWN button action.

After five seconds of inactivity, the OSD disappears. When the brightness level reaches either a maximum or minimum, further UP or DOWN button activation will introduce no further change.

The effect of the BRIGHTNESS level is not permanent. The associated values shall be stored in the RAM. The next time the CCU is powered-up, the ELC BRIGHTNESS value associated with the default or selected procedure is restored.

When the SELECT button is pressed again, the main OSD Menu is displayed on the screen. The UP and DOWN buttons revert to the assignment selected in the BUTTON SETUP menu.

Camera Control Menus (continued)

Procedure

The PROCEDURE menu includes four factory presets (ARTHROSCOPY, LAPAROSCOPY, CYSTOSCOPY, ENT) and two Custom Settings (CUSTOM1 and 2), which may be customized in the hospital by trained operators or by factory field service representatives. FLEXIBLE SCOPE FILTER A and FLEXIBLE SCOPE FILTER B are also included to eliminate Moire patterns in procedures using a fiberscope. On the next power-up, ARTHROSCOPY is the default procedure setting, unless the default procedure has been programmed with another choice.

ARTHROSCOPY

LAPAROSCOPY

CYSTOSCOPY

ENT

CUSTOM1

CUSTOM2

FLEXIBLE SCOPE FILTER A

FLEXIBLE SCOPE FILTER B

When the PROCEDURE button on the CCU front panel is pressed, or when the PROCEDURE menu item is selected, only one procedure entry name is displayed on the OSD sub-menu, versus the entire list of available procedures. This simpler display allows the viewer to more appropriately visualize and judge the effect on image quality. Pressing the SELECT button again will cycle through the available PROCEDURES. After five seconds of inactivity, the OSD disappears.

Button Setup

The BUTTON SETUP Menu enables the TOP, MIDDLE and BOTTOM buttons of three-button camera heads to perform shortcuts without calling up the OSD Menu. When any of these camera head buttons are pressed while the OSD Menu is not on the surgical display screen, the default functions assigned to those buttons are executed. Alternatively, when the MAIN MENU is called up via the SELECT button from the CCU front panel, the TOP, MIDDLE and BOTTOM camera head buttons are assigned UP, SELECT, and DOWN functions, respectively. Normal menu entries will take precedence over the default assignment during the time the OSD Menu is displayed.

The functions that are assigned to the TOP and BOTTOM or the LEFT and RIGHT buttons are shown in the following menu structure:

BUTTON SETUP MENU

LEFT/TOP:	**ENHANCEMENT**
RIGHT/BOTTOM:	**BRIGHTNESS**
MIDDLE:	**ACC. 1**

MAIN MENU

Camera Control Menus (continued)

The menu includes the ability to configure the camera head buttons to control the rear panel accessory ports (Accessory 1 and 2) to enable the user to control an assigned printer or an image capture device. When an accessory port is assigned to a PRINTER or to "FREEZE FRAME", button activation will send a still frame to the printer or to a digital image capture device. When the accessory port is assigned to VIDEO CAPTURE, the first button activation starts the recording, and the second activation stops the recording.

The CCU factory default assignments are:

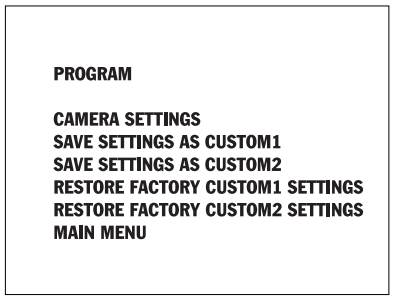
LEFT/TOP:	ENHANCEMENT
RIGHT/BOTTOM:	BRIGHTNESS
MIDDLE:	ACC.1

Language

The default language used in the OSD Menu may be selected from the following menu:

Program

The PROGRAM menu allows users and field service representatives to adjust most parameters that affect the image quality of the camera, as well as to customize two Surgical Procedure Settings (CUSTOM1 and 2). At the PROGRAM MENU the following selections are displayed:



Camera Settings

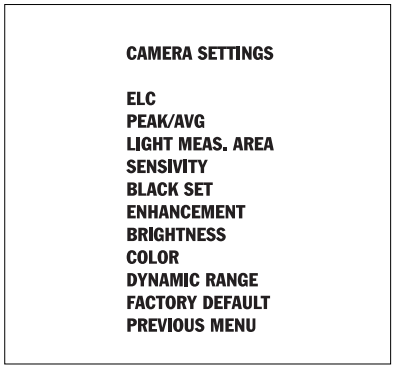
To reduce inadvertent activation, the PROGRAM button must be depressed continuously for at least three seconds in order for this function to be activated otherwise no sub-menus will display.

All parameters that control the CAMERA SETTINGS, except BLACK SET, are programmed in the menu structure shown without opening another sub-menu level. In-place programming will involve the following steps:

- The UP and DOWN buttons are used to highlight the sub-menu entry to be programmed. The data field of the selected sub-menu is not highlighted.
- Once the parameter name is highlighted, pressing the SELECT button will highlight the data field.
- Pressing the UP or DOWN buttons will change the highlighted data field value.
- Pressing the SELECT button again will cause the highlighted data field value to be loaded in RAM. If that parameter is to be retained on power-down, it will also be written to non-volatile memory.
- Pressing the UP or DOWN buttons will unhighlight the data value and move the cursor up or down.

Camera Control Menus (continued)

Selecting the factory default will reset all the CAMERA SETTINGS parameters.



ELC (Electronic Light Control)

The entries available under the ELC sub-menu include:

- AUTO
- MANUAL SHUTTER

The default value is AUTO. When the MANUAL SHUTTER value is selected, the shutter speed is written to RAM. The camera reverts to AUTO ELC on the next power-up, or when AUTO ELC is selected again. This function is not available if AUTO Light Measurement Area has been selected.

Peak/Avg

The available entries are 1 through 8. When 1 is selected, the ELC uses the peak luminance within the LIGHT MEASUREMENT AREA for feedback control of the BRIGHTNESS. When 8 is selected, the ELC uses the average luminance for feedback control. The factory default is 4 for the ARTHROSCOPY setting and 8 for the LAPAROSCOPY, CYSTOSCOPY, and ENT settings. This selection is written to RAM. On the next power up, the PEAK/AVG value reverts to the factory default. This camera setting is not available when AUTOMATIC is chosen for Light Measurement Area.

Light Measurement Area

The luminance within the light measurement area is averaged and monitored by the electronic circuitry to provide a feedback signal to maintain a consistent level of brightness. Shutter speed and other camera parameters are controlled to maintain the video brightness. Under certain conditions, it may be desirable to change the averaging area in order to produce optimal brightness, such as minimizing the effects from shiny, metallic surgical equipment or the black circular entrance aperture of smaller-diameter endoscopes.

The entries available under the LIGHT MEASUREMENT AREA sub-menu include:

- FULL
- CENTER
- SMALL CIRCLE
- MEDIUM CIRCLE
- LARGE CIRCLE
- AUTOMATIC

The default value is LARGE CIRCLE.

Sensitivity

The SENSE UP function is only available for a Progressive scan camera head. For Interlace camera heads, this selection is not displayed. The entries available under the SENSITIVITY sub-menu include:

- NORMAL
- LOW LIGHT

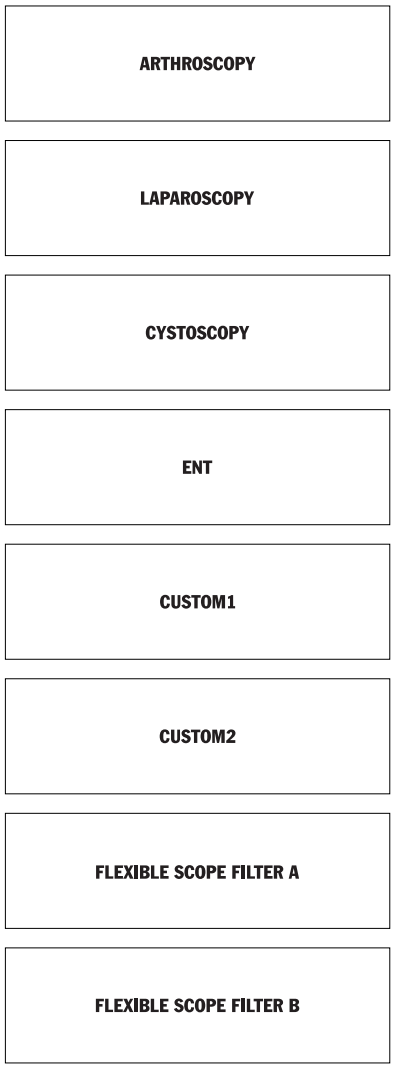
The default value is NORMAL, which specifies one single vertical field integration. LOW LIGHT improves the sensitivity by using 2-vertical field integration, but at the cost of a slower effective frame rate. When the LOW LIGHT option is selected, the setting is written to RAM. The camera reverts to NORM on the next power-up.

Black Set

For factory use only.

Custom1 and 2

The CCU supports eight custom surgical procedures, ARTHROSCOPY, LAPAROSCOPY, CYSTOSCOPY, ENT, CUSTOM1, CUSTOM2, and FLEXIBLE SCOPE FILTER A and FLEXIBLE SCOPE FILTER B. The first four are factory preset. CUSTOM1 and 2 are user-programmable.



Camera Control Menus (continued)

The two CUSTOM surgical procedures allow the full range of camera image quality to be adjusted and stored in non-volatile memory. These CUSTOM settings may be recalled during surgery by pressing the PROCEDURE button on the front panel, or by calling-up the MAIN OSD Menu with the SELECT button on the front panel and moving down the menu structure.

On power-up, the default procedure (factory set to ARTHROSCOPY) is loaded as the default surgical procedure, depending on the default selection in the CAMERA SETTINGS Menu. Users may use the top-level menu to load other custom surgical procedure settings.

CUSTOM1 and 2 may be programmed in the hospital using the menus. The CUSTOM settings thus programmed are stored so settings are retained on next power-up unless they are reset.

Selecting the FACTORY DEFAULT for the selected procedure will reset all its customizable parameters back to the factory default associated with that selected procedure.

Brightness

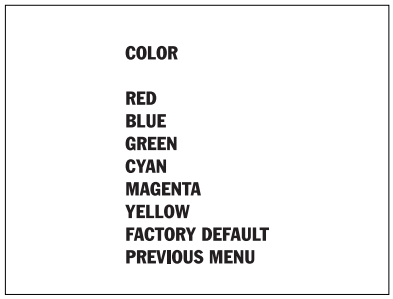
The BRIGHTNESS sub-menu is identical to the one detailed on page 37. On selection of the BRIGHTNESS value, the menu reverts back to the CUSTOM menu shown in the COLOR PROGRAMMING MENU.

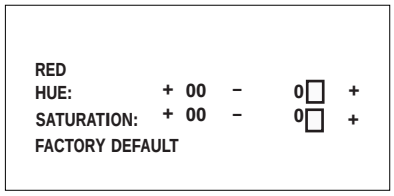
Color

This menu allows the HUE and SATURATION of the RED, GREEN, BLUE, CYAN, YELLOW and MAGENTA to be adjusted from normal factory settings.

The color settings are stored in non-volatile memory, so settings are retained on the next power-up.

Two levels of factory defaults may be recalled: for each individual color, or for all six colors as a group.The menu and sub-menu are shown below. Five seconds after each of the HUE and SATURATION levels for each color are selected, the menu reverts to the COLOR sub-menu.





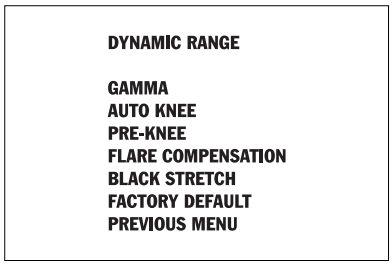
Camera Control Menus (continued)

Dynamic Range

The parameters that control the DYNAMIC RANGE are programmed in-place, that is, without opening another level of sub-menu. In-place programming involves the following steps:

- The UP and DOWN buttons are used to highlight the sub-menu entry to be programmed. The data field of the selected sub-menu is not highlighted.
- Once the parameter name is highlighted, pressing the SELECT button will highlight the data field.
- Pressing the UP and DOWN button will change the highlighted data field value.
- Pressing the SELECT button again will cause the highlighted data field value to be loaded in RAM. If that parameter is to be retained on power-down, it will also be written to non-volatile memory.
- Pressing the UP or DOWN button will unhighlight the data value and move the cursor up or down.

Selecting the factory default will reset all the DYNAMIC RANGE parameters to the factory settings, without affecting other settings such as DETAIL CONTRAST, BRIGHTNESS, or COLOR.



The entries available under GAMMA are: OFF, LOW, NORMAL, HIGH

LOW, NORMAL, and HIGH correspond approximately to 0.35, 0.45, and 0.55.

The entries available under AUTO-KNEE are: ON, OFF.

The entries available under PRE-KNEE are: ON, OFF.

The entries available under WHITE SHADING are: LOW, NORMAL, HIGH

LOW corresponds to manual white shading and NORMAL and HIGH correspond to auto white shading.

The entries available under FLARE COMPENSATION are: ON, OFF.

The entries available under BLACK STRETCH are: ON, OFF.

Flexible Scope Filter

Two flexible scope filters are included in the menu to allow the user to optimize the image for fiberscopes. Fiber optic scopes typically produce Moire and “chicken wire” patterns. The flexible scope filter uses a combination of 2D filter, DTL Band, H DTL Gain and V DTL Gain to set the bandwidth to smooth out the high frequency spatial noise. A normal tradeoff associated with flexible scope filters is reduced spatial detail or resolution.

Two factory preset MOIRE filters are available for user selection. FLEXIBLE SCOPE FILTER A is the default, with the 2D filter set at low. FLEXIBLE SCOPE FILTER B uses the 2D filter at the high setting.

When activated, the OSD will appear.

Cleaning the Camera Control Unit

- Before the equipment is cleaned, the power to the CCU should be turned “OFF” and the camera head disconnected.
- The CCU should be wiped down with a clean dry cloth after every procedure.
- Use a damp cloth or sponge to remove dirt or debris. Avoid getting liquid into the side vents and never immerse the CCU in any solution.
- After cleaning, store the equipment in a cool, dry place out of direct sunlight or excessive heat.

Cleaning and Sterilizing the Camera Heads

Refer to the Instructions for Use provided with the camera head.

Cleaning the Fan Grill

It is important to periodically inspect and clean the fan grill on the rear of the unit and the exhaust holes on the side of the unit. The most effective method is to use a vacuum with a soft brush attached. A soft, damp cloth may also be used to remove any accumulations in these areas.

Service

Service Philosophy

There are no user-serviceable components inside the Smith & Nephew 450P and 460P 3-CCD Camera Control Units. Repairs and adjustments are to be performed only by Smith & Nephew authorized service centers.

If service becomes necessary, call your authorized Smith & Nephew Customer Service Representative prior to returning the device and request a Return Authorization (RA) number. Your representative can also explain the available Service Replacement and Repair Programs.

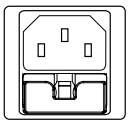
Service items should be carefully repackaged and returned postage-paid to Smith & Nephew. Your Smith & Nephew Customer Service Representative can provide additional instructions.

Note: Returned product that is found to have been serviced by an unauthorized third party repair facility will incur additional costs, regardless of warranty status.

It is not necessary to include accessory items (i.e., power cords, paper trays, footswitches, remote controls, etc.) when returning a device for service.

Do not remove any digital interface boards that may be installed in your unit.

Changing Fuses



Fuses may have to be changed occasionally. For example, if the camera power switch does not illuminate, the cause is generally a blown fuse. Change the fuses as follows:

- Remove the power cord from the power module on the back of the CCU.
- Remove the fuse by pressing the release lever and pulling out the fuse holder.
- Replace the fuse with the same type and quality of fuse. For 100–120 V ~ applications, use two 1 Amp 250 volt slow blow (20 mm x 5 mm).

Maintenance

Recommended Annual Performance Checks

Smith & Nephew recommends that dielectric strength, earth leakage current, and protective earth testing be performed annually to assure continued compliance with applicable safety requirements. These tests should be conducted in accordance with specifications UL 2601-1/ IEC 60601-1.

Caution: *Electrical safety testing should be performed by a biomedical engineer or other qualified person.*

Electrical Interference

Caution: *This equipment is designed and tested to minimize interference with other electrical equipment. However, if interference does occur with other equipment it may be corrected by one or more of the following measures:*

- *Reorient or relocate this equipment, the other equipment, or both.*
- *Increase the separation between the pieces of equipment.*
- *Connect the pieces of equipment into different outlets or circuits.*
- *Consult a biomedical engineer.*

Environmental Protection

Caution: *This equipment contains electronic printed circuit assemblies. At the end of the useful life of the equipment it should be disposed of in accordance with any applicable national or institutional related policy relating to obsolete electronic equipment.*

Troubleshooting

The Smith & Nephew 450P and 460P 3-CCD Camera Control Units are designed to provide the highest quality video image available. However, should problems occur, please use the following guide to make troubleshooting easier. If the problem persists, contact your Smith & Nephew representative.

Fault Indicator	Solution
No picture on monitor	1. Video cable is broken. Check cable for cuts or a loose connector. Try another cable. 2. Turn on the CCU and monitor and disconnect the camera head from the CCU front panel. If a color bar appears, the system is wired correctly. 3. Ensure that the monitor input switch is set to the camera input line. For example, the monitor may be on line "B" while the hookup is on line "A." 4. Check to make sure that the VCR and/or the video printer are turned "ON" with the correct input selected.
Camera power switch does not illuminate	1. Verify that the camera plug is firmly connected to the appropriate wall outlet. 2. Check for a blown fuse on the rear panel.
Camera color not correct	1. White Set the camera head as described in this manual.
Image too dark	1. Turn up the light intensity control on the light source. 2. Adjust the brightness using the BRIGHTNESS button on the CCU front panel. 3. Check the light source for old bulbs, as appropriate. See the Maintenance section in the light source manual for instructions. 4. Check the scope and fiber optic light guide for damage.
Image too bright/ excess glare	1. Adjust the brightness using the BRIGHTNESS button on the CCU front panel.
Image too grainy	1. Check for proper connection settings to ensure that, if the monitor is in a looping sequence, the 75 Ω switch is "ON" on the last monitor, provided that setting is available on the monitor.

Fault Indicator	Solution
Image is cloudy or hazy	1. Camera is out of focus. Adjust the focus on the coupler or the videoendoscope. 2. Optics are dirty. Clean both the scope and the coupler. See the Maintenance section in this manual. 3. The scope or coupler is fogging. Fogging results when the light in the scope warms the air space and trapped moisture condenses on the glass window. Use a suction tube to remove the moisture or dry the equipment using the manufacturer's recommended procedure. 4. Clean anti-fogging agent off lenses. The use of anti-fogging agent is not recommended.
Intermittent picture	Camera Head Cable is failing. Contact Customer Service.
No IEEE-1394 data received by the accessory or computer	1. Ensure the CCU is turned ON. 2. Ensure the accessory or computer is turned "ON" and active. 3. Ensure IEEE-1394 cable connectors are seated properly in the IEEE-1394 ports both at the rear of the 460P Camera Control Unit and in the accessory or computer. 4. If the cable is loose or disconnected and requires reseating, you may need to turn the power to your accessory OFF/ON or reboot your computer. If the problem persists, switch the light source to manual mode and contact your Smith & Nephew representative.

450P/460P 3-CCD Camer Control Unit Specifications*

Equipment Classification

Protection against electrical shock Class 1 with CF type applied part.

Protection against harmful ingress of water. (Ordinary equipment, none provided)

Degree of safety of application in the presence of flammable anesthetics with mixture of air, oxygen, or nitrous oxide. (Not suitable)

Resolution

Horizontal: 800 TV lines (RGB or Y/C)
Vertical: 450 lines (Progressive scan only)

Signal-to-Noise Ratio

Greater than 60 dB

Shutter

NTSC: 1/60 per second through 1/10,000 per second shutter speed

PAL: 1/50 per second through 1/10,000 per second shutter speed

Scanning System

NTSC/Interlaced Mode: 525 lines, 60 fields, 30 frames 2:1 Interlaced

NTSC/Progressive Mode: 525 lines, 60 frames

PAL/Interlaced Mode: 625 lines, 50 fields, 20 frames 2:1 Interlaced

PAL/Progressive Mode: 625 lines, 50 frames

RGB Video Output

One video output 1Vp-p, RGB and SYNC into 75 Ω, BNC coaxial connectors (Interlace/Progressive switchable)

Y/C Video Outputs

Two Y/C video outputs, combined luminance/ chroma signal into 4-pin mini-DIN plug

IEEE–1394 Output

One IEEE-1394 digital video output, 4-pin connector; provides continuous DV-formatted (5:1) compressed 25 Mb/sec data rate

Serial Digital Interface

One serial digital interface (SDI) with 4:2:2 component digital video output on BNC connector

Digital Visual Interface

Two digital visual interface supporting DVI-Digital (DVI-D) single-link interfaces on 29 pin DVI-I connector

Minimum Illumination

5 lux at f1.4

AC Leakage Current

CCU: less than 300 microamps earth leakage

Power Requirements

100–240 VAC, 50/60 Hz

Operating Temperature

41° F (5° C) to 108° F (42° C)

CCU Dimensions/Weight

3.0 in (7.6 cm) x 14.35 in (36.4 cm) x 17.0 in (43.2 cm)/less than 9.0 lbs (4.37 kg)

Video Accessory Controls

Two mini-phono connectors

Included Accessories

One 6-pin-to-6-pin, 15 ft IEEE-1394 interconnect cable (REF 8109734) (460P only)

One RGB-SYNC cable (REF 130-0068)

One Y/C cable (REF 130-0053)

Classification

CISPR 11 Class A.

**Specifications subject to change without notice.*

REF	Description

NTSC Camera Control Units

72200085 Smith & Nephew 450P 3-CCD Camera Control Unit, HERMES compatible, 120/240 VAC, 50/60 Hz. Includes, video cables, English Operations/Service Manual, U.S. power cord.

72200086 Smith & Nephew 460P 3-CCD Camera Control Unit, HERMES compatible, zoom functionality, two DVI digital interface outputs, one SDI Digital Interface Output, one IEEE-1394 DV output, 120/240 VAC, 50/60 Hz. Includes video cables, English Operations/Service Manual, U.S. power cord.

PAL Camera Control Units

72200103 Smith & Nephew 450P 3-CCD Digital Camera Control Unit, DV output, HERMES compatible, 120/240 VAC, 50/60 Hz. Includes, video cables, English Operations/Service Manual, U.K. power cord.

72200105 Smith & Nephew 450P 3-CCD Digital Camera Control Unit, DV output, HERMES compatible, 120/240 VAC, 50/60 Hz. Includes, video cables, English/German/Spanish/French/ Italian/Swedish/Dutch Operations/Service Manual, International power cord.

72200104 Smith & Nephew 460P 3-CCD Digital Camera Control Unit, DV output, HERMES compatible, zoom functionality, two DVI digital interface outputs, one SDI Digital Interface Output, one IEEE-1394 DV output, 120/240 VAC, 50/60 Hz. Includes video cables, English Operations/Service Manual, U.K. power cord.

72200106 Smith & Nephew 460P 3-CCD Digital Camera Control Unit, DV output, HERMES compatible, zoom functionality, two DVI digital interface outputs, one SDI Digital Interface Output, one IEEE-1394 DV output, 120/240 VAC, 50/60 Hz. Includes video cables, English/German/Spanish/French/ Italian/Swedish/Dutch Operations/Service Manual, International power cord.

Accessories

7210018 Smith & Nephew 300 Series 3-CCD HERMES Interface Kit

REF	Description

Compatible NTSC Camera Heads

72200092 Smith & Nephew 470H Multimode Camera Head, NTSC, 30° cable offset from camera head, three buttons for menu accessory control

72200090 Smith & Nephew 460H Camera Head, NTSC, 30° cable offset from camera head, three buttons for menu accessory control

72200693 Smith & Nephew 400-series ED-3 Camera Head, NTSC, 0° cable offset from camera head, two buttons for menu accessory control

72200694 Smith & Nephew 400-series ED-3 Camera Head, NTSC, 30° cable offset from camera head, two buttons for menu accessory control

Compatible PAL Camera Heads

72200093 Smith & Nephew 470H Multimode Camera Head, PAL, 30° cable offset from camera head, three buttons for menu accessory control

72200091 Smith & Nephew 460H Camera Head, PAL, 30° cable offset from camera head, three buttons for menu accessory control

Glossary

AC
Alternating Current.

Aliasing
Stairstepping or slightly jagged edge of an image on a monitor when viewed up close. Particularly noticeable in curved lines. Most noticeable in Composite Video Format.

Aperture
An adjustable opening or iris, which determines how much of the available light reaches the camera video chip or Charged Coupled Device. Affects the field of view and focus.

Auto Shutter
See **Electronic Shutter**.

Beamsplitter
An optical component (coupler) used on video cameras and operating microscopes which splits available light between the eye and video camera. Normally rated as a ratio of light available to the camera/light available to the eye (i.e., 90:10 camera:eye).

Blooming
Glare on the monitor. Distorted or washed out image caused by camera control unit sensing too much light.

BNC (Bayonet Nut Connector)
Standard composite video and RGB connector.

Brightness
One of four video characteristics (brightness, contrast, hue and chroma) that are changed externally by altering the intensity of the video signal. Brightness affects the Luminance (black and white) signal by increasing or decreasing the intensity (voltage) of the scanning electron beam that creates the picture.

C-Mount
A standard lens mount for threaded television camera lenses. One inch (2.54 cm) in diameter with 32 threads per inch. See **V-Mount**.

CCD (Charged Coupled Device)
Video chip in camera head that converts light (optical) energy to an electrical signal to be transmitted to the monitor. Chip converts light energy using pixels. See **Pixels**.

CCU (Camera Control Unit)
Provides DC power and signal processing required to convert the signal from the camera head into one that can feed video monitors and recorders.

Chrominance (Chroma) Signal
One half of the video signal containing the color information to the monitor. The other half is luminance signal. It is the quality of color which embraces the "Hue" and "Color Intensity" of the image. Monochrome (black and white) video has no chroma signal. See **Y/C** or **RGB**.

Color Signal
At present, the NTSC color, PAL color and SECAM color television systems are the color formats used for broadcasting. This system simultaneously supplies both the "chrominance signal" which transmits three primary color components of light (red, green, and blue) and the "luminance signal" which cause brightness to the screen.

Color Temperature
Reference of color content emitted from a source of light in degrees Kelvin (K). The higher the temperature, the whiter the light.

Sunny Day	6000 K
Xenon Lamp	5900 K
Metal Halide	5500 K
Tungsten Lamp	3200 K

Complementary Colors
The three primary colors (cyan, yellow and magenta) which, when combined in varying configurations, produce one of the three composite colors. **For example:**

Yellow + Cyan = Green
Yellow + Magenta = Red
Cyan + Magenta = Blue

Component Video Signal
A video signal which separates chrominance from luminance as well as the burst and sync signal. R-Y/Y/B-Y, RGB, and S-VHS are component video signals.

Composite Video Signal
Standard television signal. A complex mixture of video information (luminance and chrominance) plus burst and sync signal transmitted via a single video signature. Highest signal interference. Significant aliasing. Normally called "Video IN" or "Video OUT." See **Aliasing**.

Contrast
One of four video characteristics (brightness, contrast, hue and chroma) that are changed externally by altering the amplitude of the video signal. Contrast is a function of the luminance (black and white) signal and controls the relationship between proximal and distal images by highlighting the light and dark areas of the picture.

Decibel (dB)
A standard measure of relative intensity or power. Used to express signal to noise ratio and signal gain. See **S/N**.

Depth of Field
The range in which objects in a particular field of view through a photographic lens appear to be in focus. The depth of field increases as the iris opening of the lens decreases. See **Aperture**.

Digital Signal Processing
A major technology breakthrough that converts an analog electronic signal (represented on an oscilloscope as a sine wave), to a digital signal (signal translated into binary numerical digits) that can be mathematically manipulated by a computer.

DV (Digital Video)
DV is a digital tape format developed for consumer digital video applications by a consortium of consumer electronics companies, including Sony, Panasonic, JVC, and Philips. DV images use a 5:1 compression technique with a maximum data rate of 25 Mb/sec.

DVI (Digital Visual Interface)
A high speed digital connection for visual data types that is display technology independent. The interface is primarily focussed at providing a high quality digital connection between a computer and its display device.

Electronic Shutter
A function incorporated in newer CCDs that electronically adjusts the amount of light absorbed at the individual pixel level. In this way, the CCD replicates the function of an automatic light source internally. Mechanical light adjustments from an external light source become less important.

F-Stop
A calibration expressing a specific aperture opening on a camera lens. It expresses the amount of light reaching a focal plane or CCD chip. See **Aperture** and **Depth of Field**.

Field
One half of the scan lines that make up a video picture. Each video field is created by an angled electron beam sweeping horizontally and vertically (left to right, top to bottom) in a zigzag pattern, across the monitor screen. One complete beam sweep occurs in 1/60th of a second. A second field of scanning lines begins 1/60th of a second later, at the screen midline, at the top of the screen, and completes its screen sweep in 1/60th of a second. Two fields of screen lines is called a frame.

Frame
Made up of two sequentially generated scan lines created by an electron beam that are interlaced together to give 525 horizontal lines of vertical resolution for NTSC monitors and 625 for PAL monitors.

Horizontal Resolution
A measure that shows to what extent details can be distinguished on a video monitor and is generally evaluated by establishing the limit to which lines can be distinguished on a standard test pattern. Resolution represents the maximum number of lines that can be seen to be clearly separated with the naked eye.

Hue (Phase)
One of four video characteristics (brightness, contrast, hue and chroma) that are changed externally by altering the phase rotation of the video signal. Normally, this is the green purple control on monitors. Refers to the electronic adjustment (or phase rotation) of the primary color mixture inherent in the video picture.

IEEE-1394
The IEEE-1394 is a 1995 Microcomputer Standard for the High Performance Serial Bus which defines a high-speed, serial data transfer protocol and interconnection system. The capabilities of the IEEE-1394 serial bus are sufficient to support a variety of high-end digital audio/video applications. IEEE-1394 output is 400 Mb/sec.

I.R.E.
A standard measurement on a waveform oscilloscope used to quantify the strength of the luminance signal. I.R.E. stands for Institute of Radio Engineers and indicates a standard measurement. See **Lux**.

Line In/Line Out
Also called Video In/Out. Usually refers to the Composite Video signal.

Luminance
One half of the video signal containing the black and white information to the monitor. The other half is chrominance signal. It is the quality that gives brightness and contrast to the video signal. Abbreviated as Y (white) in Y/C. A monochrome (or black and white) video signal is the luminance signal without chrominance.

Lux
Refers to the ability to gather light or is a measure of the sensitivity of a component to light. Lux is a meaningless statement unless stated in conjunction with f-stop and I.R.E. (i.e., 10 lux is meaningless; 30 lux at f1.4 = 90 I.R.E. is a valid and meaningful statement).

Noise (Interference)
Random spurts of electrical energy that interferes with the video image. Appears on the monitor as a grainy picture or snow.

NTSC
National Television Systems Committee. Sets standards for U.S. color television signals. Format is 525 horizontal scan lines (vertical resolution) at 50/60 Hz.

OSD (On-Screen Display)
Information or error messages superimposed on the display screen which allow users to customize video settings for their particular application.

PAL
Phase Altering Line System. PAL format is employed in many European and Asian countries. Format is 625 horizontal scan lines (vertical resolution) at 50/60 Hz.

Pixel
Receptors on the face of the video chip (CCD) which convert light energy to electrical energy. Total number of pixels influences total horizontal resolution.

Raster
This is the combination of the odd and even *field* scan lines in a *frame* of 525 lines which effectively scans every picture element on the monitor target plate.

Resolution
This is the overall quality of the detail in the video picture. Consists in two parts of vertical resolution (horizontal scan lines that can be resolved in the picture height) and horizontal resolution (vertical lines defined by the video amplifier band width).
See **Horizontal** and **Vertical Resolution**.

RGB Signal
A video format in which the signal is separated into four distinct signals (red, green, blue, and external synchronization) carried on four separate cables, and when combined make up all colors. The resulting image is exceptionally sharp, with distinct color separation and high definition.
See **Complementary Colors**.

SDI (Serial Digital Interface)
A standard that describes how to transport digital video serially over a video coax cable. The interface is useful in transmitting high quality video over long distance (hundreds of feet) over existing analog video infrastructure.

Y/C, S-VHS (S-Video Signal)
Component signal with *Chrominance* and *Luminance* transmitted separately. Signal is unstable and does not travel well over long distances (over 12 feet).

S/N Ratio
Signal-to-Noise Ratio. This is the ratio of the video signal to the amount of noise inherent in the system. Current video systems have S/Ns in the range of 48 dB.

Saturation
One of four video characteristics (brightness, contrast, hue and chroma) that are changed externally by altering the intensity of the video signal. Saturation refers to the vividness or strength of a color as determined by the amount it is diluted by white light.

Termination
End of the signal line. Normally the termination switch is engaged at the final component that the signal travels to; normally the monitor.
75 Ω (ohm) resistance is applied at that point against the signal.

V-Mount
A standard lens mount for threaded television camera lenses with a 9/16" (14.29 mm) diameter and 32 threads per inch. See **C-Mount**.

Vertical Resolution
Refers to the horizontal scan lines that can be resolved in the picture height. This will not affect the resolution that is referred to in camera resolution. This is a figure set by NTSC format (525 horizontal scan lines at 50/60 Hz).

White Set
Readjusts primary color components using a white base line so that white objects appear white on the monitor screen. This eliminates any color bias in the picture.

Table 1. Guidance and Manufacturer's Declaration – Electromagnetic Immunity

The Smith & Nephew 450P and 460P 3-CCD Camera Control Units are intended for use in the electromagnetic environment specified below. The customer or the user of the 450P and 460P 3-CCD Camera Control Units should assure that they are used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment - Guidance
			Portable and mobile RF communications equipment should be used no closer to any part of the 450P and 460P 3-CCD Camera Control Units, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance**
Conducted RF IEC 61000-4-6	3 Vrms 150 KHz to 80 MHz	3 Vrms	$d = 1.2\sqrt{p}$
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	3 V/m	$d = 1.2\sqrt{p}$ 80 MHz to 800 MHz $d = 2.3\sqrt{p}$ 800 MHz to 2.5 GHz Where ***p*** is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and ***d*** is the recommended separation distance in meters (m). Field strength from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol:

Note 1: At 80 MHz and 800 MHz, the higher frequency range applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

[a] Field strengths from fixed transmitters, such as base stations for radio, (cellular/cordless) telephones, land mobile radios, amateur radios, AM and FM radio broadcasts, and TV broadcasts cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the 450P and 460P 3-CCD Camera Control Units are used exceeds the applicable RF compliance level above, the 450P and 460P 3-CCD Camera Control Units should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the 450P and 460P 3-CCD Camera Control Units.

[b] Over the frequency range 150 KHz to 80 MHz, field strengths should be less than 3 V/m.

Guidance and Manufacturer's Declaration – Electromagnetic Immunity (continued)

Table 1: Guidance and Manufacturer's Declaration – Electromagnetic Immunity (continued)

The Smith & Nephew 450P and 460P 3-CCD Camera Control Units are intended for use in the electromagnetic environment specified below. The customer or the user of the 450P and 460P 3-CCD Camera Control Units should assure that they are used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment - Guidance
Electrostatic (ESD) discharge IEC 61000-4-2	+/- 6kV contact +/- 8kV air	+/- 6kV contact +/- 8kV air	Floors should be wood, concrete or ceramic tiles. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	+/- 2kV for power supply lines +/- 1kV for input/ output lines	+/- 2kV for power supply lines +/- 1kV for input /output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	+/- 1kV differential mode +/- 2kV common mode +/- .5kV input/ output	+/- 1kV differential mode +/- 2kV common mode +/- .5kV input/ output	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles <70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 sec	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles <70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 sec	Mains power quality should be that of a typical commercial or hospital environment. If the user of the 450P and 460P 3-CCD Camera Control Units requires continued operation during power mains interruptions, it is recommended that the 450P and 460P 3-CCD Camera Control Units be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3A/m	3A/m	The power frequency magnetic field should be at levels characteristic of a typical location in a typical commercial or hospital environment.

Note: U_T is the a.c. mains voltage prior to application of the test level.

Table 2. Guidance and Manufacturer's Declaration – Electromagnetic Emissions

The Smith & Nephew 450P and 460P 3-CCD Camera Control Units are intended for use in the electromagnetic environment specified below. The customer or the user of the 450P and 460P 3-CCD Camera Control Units should assure that they are used in such an environment.

Emissions Test	Test Level	Electromagnetic Environment - Guidance
RF emissions only CISPR 11	Group 1	The 450P and 460P 3-CCD Camera Control Units use RF energy for their internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	The 450P and 460P 3-CCD Camera Control Units are suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	N/A	
Harmonic fluctuations/ flicker emissions IEC 61000-3-3	N/A	

Table 3. Recommended separation distances between portable and mobile RF communications equipment and the Smith & Nephew 450P and 460P 3-CCD Camera Control Units

The Smith & Nephew 450P and 460P 3-CCD Camera Control Units are intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or user of the 450P and 460P 3-CCD Camera Control Units can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the 450P and 460P 3-CCD Camera Control Units as recommended below, according to the maximum output power of the communications equipment.

Rated Maximum Output Power of Transmitter W	**Separation distance according to frequency of transmitter M**		
	150 KHz to 80 MHz $d = 1.2\sqrt{p}$	**80 MHz to 800 MHz** $d = 1.2\sqrt{p}$	**800 MHz to 2.5 GHz** $d = 2.3\sqrt{p}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance ***d*** in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where ***p*** is the maximum output power rating of the transmitter in watts (w) according to the transmitter manufacturer.

Note 1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

Warranty

Smith & Nephew products are guaranteed to be free from defects in material and workmanship for the warranty period for a particular product, beginning from date of invoice. Refer to the current Smith & Nephew Product Catalog or contact Smith & Nephew Customer Service for specific warranty information.

This limited warranty is restricted to repair or replacement by Smith & Nephew, at its option, of any product found to be defective during the warranty period. Damage inflicted to a product by the user that causes it to be unsuitable for refurbishment may result in additional charges, regardless of warranty status. All warranties apply to the original buyer only. In no event shall Smith & Nephew, be liable for any anticipated profits, consequential damages or loss of time incurred by the buyer with the purchase or use of any product.

NO OTHER WARRANTY, EXPRESSED OR IMPLIED, IS GIVEN.

Service Replacement Program

Smith & Nephew offers a 24-hour Service Replacement Program for its products to minimize downtime in your operating room. Our goal is to ship you a service replacement unit within 24 hours** of your call (during normal business hours). For a Return Authorization (RA) number or for additional information on this program, call Customer Service at 1-800-343-5717 in the U.S., or contact your authorized representative.

**24-hour shipment is not offered in all countries.

EC REP

Smith & Nephew Endoscopy
York Science Park
Heslington, York YO10 5DF
United Kingdom

®Trademarks of Smith & Nephew. Certain marks registered U.S. Patent & Trademark Office.
All other trademarks acknowledged.

Endoscopy
Smith & Nephew, Inc.
Andover, MA 01810
USA

www.smith-nephew.com
978 749 1000
978 749 1108 Fax
800 343 5717 U.S. Customer Service

©2003, 2005 Smith & Nephew, Inc.
All Rights Reserved.

12/05 10600023 Rev. B